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KATSURA (K.). **Studies on Trametes dickinsii Berk. causing the dry-rot of sleepers.**—*Forsch. PflKr., Kyoto,* iii, pp. 268–288, 2 pl., 1937. [Japanese, with English summary. Received August, 1938].

Trametes dickinsii is the agent of a powdery, brown rot of railway sleepers made of chestnut, oak, *Pasania,* and beech wood in Japan [*R.A.M.*, xiii, p. 135]. The sporophores of the fungus usually develop on the sides and cut ends of the sleepers, and their common habit of uniting produces deformed structures. The best media of the 18 tested for the growth of the organism were soy-bean with onion and apricot decoctions, on which the loose aerial mycelium gradually turned from white to light brownish. Development occurred throughout a temperature range from 6° to 40° C., with an optimum at about 30°. The mycelium from potato decoction agar was destroyed by ten minutes' heating in a water bath at 60°. Microchemical and cultural tests showed that the fungus belongs to the cellulose-dissolving group [cf. ibid., viii, p. 281; xvii, pp. 361, 495 *et passim*].

The design of timber floors to prevent dry rot. Notes from the Information Bureau of the Building Research Station.—*J. R. Inst. Brit. Architt., Suppl.*, 4th Ser., 1, 7 pp., 1 diag., 1938.

A summary, prepared in co-operation with the Forest Products Research Laboratory, is given of the available knowledge on the design and construction of three types of wooden floors—solid, partially suspended, and totally suspended—by methods calculated to prevent infection by *Merulius lacrymans* and *Coniophora cerebella* [*C. puteana*: *R.A.M.*, xvi, p. 508].

WATERMAN (R. E.), LEUTRITZ (J.), & HILL (C. M.). **Chemical studies of wood preservation. The wood-block method of toxicity assay.**—*Industr. Engng Chem.*, Analyt. Ed., x, 6, pp. 306–314, 9 figs., 1938.

This is a full account of the newly developed method employed at the Bell Telephone Laboratories, New York, for testing wood preservatives. It is thought to incorporate the best features of the Petri dish method as developed at the Forest Products Laboratory [Wisconsin] and the Kolle flask method of Europe [*R.A.M.*, xiv, p. 411 *et passim*]; the former is objected to because of the artificial character of the dispersion of the preservative in agar, and the latter because of its liability to inhibit decay by excessive supply of water to the test block.

The test is carried out on wood blocks 2 by 2 by 2 cm. bored with a hole 0·2 cm. in diameter and numbered. All blocks are brought to a constant relative humidity of 76 per cent. at 30° C. obtained by fitting a bacteriological incubator with slow moving fans and dishes of saturated sodium chloride solution, the average time taken to reach equilibrium weights being 3 to 4 days. The volume of the blocks is calculated from the weight of mercury displaced. The blocks are then impregnated under reduced pressure, and the amount of preservative retained determined by weighing. The apparatus used for the test consists of two bottles, the smaller one, placed inside the larger, supporting a thin slab of untreated sap wood (4·5 by 2·5 by 0·3 cm.) bored with two holes 0·5 and 0·2 cm. diameter and about 1 cm. apart. The impregnated block is anchored to the thin slab by half-lengths of standard wooden applicators (16·5 cm. long) passed through the holes bored in the slab and block. Water is added to the outer bottle. Sterilization is then carried out in the autoclave, and when the apparatus has cooled sufficiently sterile water is siphoned into the inner bottle. The additional moisture requisite to secure maximum decay of the wood is supplied by conduction through the applicators. Inoculum from an agar culture is then added to the slab of wood at the end opposite the test block and the bottles incubated at 26° to 28°, usually for a period of 24 weeks.

The fungi commonly used in the tests are *Poria incrassata* [ibid., xvii, p. 635], *Coniophora cerebella* [*C. puteana*], *Polyporus vaporarius* [*Poria vaporaria*], *Fomes roseus*, and U. 10 (a virulent organism isolated from a pine pole), whilst *Trametes serialis* [ibid., xvii, p. 4], *Lenzites sepiaria*, *Polystictus versicolor* [ibid., xvii, p. 496], *Polyporus sulphureus* [ibid., xvii, p. 782], and *Fomes pinicola* [ibid., xvii, p. 567] are occasionally used in the supplementary trials. *Lentinus lepideus* and *Lenzites trabea* are chiefly used for testing organic preservatives, as these fungi have been found to be too sensitive to inorganic salts.

The results are recorded by noting the growth rating in comparison with the inoculated untreated control, the growth being designated by a pair of numbers, the first indicating the extent of the block covered and the second intensity and vigour; by computing the percentage loss in weight from the equilibrium weights before and after exposure to the fungus; and by determining the strength of exposed blocks in comparison with uninoculated impregnated controls by dissection and breaking, a rating of 10 denoting no detectable loss in strength and 0 complete disintegration. In an experiment to compare the writers' technique with the Kolle flask method, the agreement was in general very satisfactory, but the weight losses of *Pinus sylvestris* blocks attacked by *L. sepiaria* under the American test conditions are about double those of any other investigator. Specimen results are given of a number of assays carried out by the method. Evidence is stated to be accumulating from correlated field exposure tests that indicates a high degree of specificity for the method.

GIDDINGS (N. J.). **Studies of selected strains of curly top virus.**—*J. agric. Res.*, lvi, 12, pp. 883–894, 1 pl., 2 figs., 1938.

In these studies four strains of the beet curly top virus [*R.A.M.*, xvii, p. 718] were differentiated on the basis of the reaction to them of the

new highly resistant beet 1167, a selected susceptible strain 2769–24, and a susceptible European type [unspecified]. The plants were inoculated while very young by placing a viruliferous leafhopper (*Eutettix tenellus*) on each plant for a week, and the resulting symptoms graded from 0 (none) to 5 (extreme curling and dwarfing). The data obtained showed that strains 1, 2, 3, and 4 induced severe, mild, extremely severe, and mild symptoms in the susceptible beets, respectively, though all four strains showed an almost equally high ability to infect, whereas on the resistant variety strains 1 and 2 produced a high percentage of infection with mild to moderately severe and very mild symptoms, respectively, and strains 3 and 4 rare and little infection, respectively, with very mild symptoms. In tests on other hosts, strains 1 and 3 gave fairly high percentages of infection on tomato and tobacco whereas strains 2 and 4 gave no infection. Differentiation between strains 1 and 3 could not be made on these hosts or on beans (*Phaseolus vulgaris*), plantain (*Plantago erecta*), or *Lepidium nitidum*, though on the last-named strains 1 and 3 showed a significant difference in the percentage of plants infected.

HARTER (L. L.). **A root rot of Peas caused by Fusarium coeruleum.**—*Phytopathology*, xxviii, 6, pp. 432–438, 1 fig., 1938.

The writer isolated with considerable frequency from rotted roots of pea plants a species of *Fusarium* referred in spite of somewhat large spore sizes to *F. coeruleum* [*R.A.M.*, xvii, p. 374], a virulent and widely distributed organism which has not so far been described as causing root rot of peas. The fungus destroys many of the seeds before they germinate, and many seedlings are decayed before the plants emerge from the soil or soon after, whilst the plants which escape early decay, especially those that attain a height of 6 to 8 in. before they are attacked, are rarely killed. In resistance tests none of the 24 varieties of peas proved to be resistant, while the pigeon pea (*Cajanus indicus*) was almost completely immune. The range of optimum temperatures for the growth of the organism corresponded with those for the growth of the host.

NATTRASS (R. M.). **Notes on fungus diseases.**—*Cyprus agric. J.*, xxxiii, 2, pp. 55–58, 4 figs., 1938.

In Cyprus, beans [*Vicia faba*] do not generally suffer much reduction in yield as a result of infection by chocolate spot (*Botrytis fabae*) [*R.A.M.*, xvii, p. 15] but in 1938 the disease caused almost complete defoliation and loss of crop on beans approaching maturity.

All species and varieties of beet in Cyprus are susceptible to *Cercospora* [*beticola*], the leaf spots caused by which seldom exceed $\frac{1}{8}$ in. in diameter. During 1938, the leaves of leaf beet [*Beta vulgaris* var. *cicla*] were attacked by a more serious infection due to *Phyllosticta* (*Phoma*) *betae* [ibid., xiv, p. 548], the lesions caused by which reached $1\frac{1}{2}$ in. in diameter, generally had concentric markings and a pale centre, and became perforated; the lesions coalesce, and owing to their large size only a few suffice to make the crop unmarketable. The disease, however, is not widely distributed, and attempts should be made to

eradicate it by ploughing in or feeding off the affected plants; spraying with Bordeaux mixture may be carried out in the very early stages of the disease. Only healthy plants must be used for seed.

HARTER (L. L.). **Mosaic of Lima Beans (Phaseolus lunatus macrocarpus).**—*J. agric. Res.*, lvi, 12, pp. 895–906, 3 pl., 1938.

The results of the author's continued studies on the mosaic disease of Lima bean (*Phaseolus lunatus macrocarpus*) [*R.A.M.*, xv, p. 547] indicate that the causal virus is very similar to the cucumber and celery viruses and is considered to be a strain of the former. The points in which it differs from the cucumber and celery viruses are as follows: it is able to infect *Vicia faba*, while they are not; it produces a primary lesion on the inoculated leaves of tobacco not found on leaves inoculated with either of the other two viruses; it becomes inactivated at 70° C. after 10 minutes, while the celery virus needs 75°; and it withstands ageing *in vitro* longer than the cucumber virus. In resistance tests the following varieties were resistant to Lima bean mosaic: Burpee Best, Burpee Improved, Carpenteria, Challenger, Detroit, Mammoth, Dreer Bush, Dwarf Large White, Early Jersey, Fordhook, King of the Garden, Large White, Leviathan, McCrea, New Wonder, and Seibert; the susceptible varieties were Florida Butter, Florida Speckled, Henderson Bush, Hopi, Jackson Wonder, Sieva, Willow Leaf, and Woods Prolific.

PITTMAN (H. A. J.). **Bacterial blight of Beans.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xv, 2, pp. 172–177, 2 figs., 1938.

Since the first occurrence of bacterial blight (*Bacterium medicaginis* var. *phaseolicola*) [*R.A.M.*, xvii, p. 170] of beans (*Phaseolus vulgaris*) in Western Australia in 1930–1 [ibid., xi, p. 618] devastating losses have occurred in several localities in the State in extra early crops of Canadian Wonder beans. Emphasis is laid on the fact that control consists either in planting seed from disease-free crops and using new land or land that has not grown an affected crop for at least three years, or in planting resistant or immune varieties. Growers who know that their land and crops are clean are strongly advised to raise their own seed. Clean seed may be obtained from a diseased line by growing a crop during hot, dry weather, keeping down artificial watering to an irreducible minimum, and promptly removing and burning all affected plants. The seed should be sown much more widely spaced than in commercial crops. After handling diseased plants, healthy ones should not be touched until the hands have been carefully washed in carbolic soap or rinsed in methylated spirits, and no work should be done among the plants while moisture is present on them. Resistant varieties [ibid., xvi, pp. 150, 441] include Kentucky Wonder, Epicure, Pale Dun, Feltham's Prolific, and the Startler variety of butter bean. The white-seeded runner bean, apparently nameless, commonly grown in parts of Western Australia has saved the situation in the State, as it appears to be absolutely immune. It does not mature so early as Canadian Wonder, but in every other respect is a satisfactory substitute. Growers who cannot obtain entirely clean seed and plant it in clean soil are advised to give up growing the Canadian Wonder variety.

HEMMI (T.) & NIWA (S.). **On gray-mold neck rot of stored Onions.**—*Forsch. PflKr., Kyoto*, iii, pp. 234–249, 2 pl., 1937. [Japanese, with English summary. Received August, 1938.]

Grey mould neck rot is stated to be prevalent on stored onion bulbs in the markets and shops of Kyoto and Osaka, Japan, from December to May. Detailed investigations of the symptomatology of the disease and morphology of the associated fungus have led to the identification of the latter as *Botrytis allii* [*R.A.M.*, xiv, pp. 195, 710], though *B. byssoidea* [ibid., ix, pp. 82, 472] and *B. squamosa* [ibid., vii, p. 495], the agents, respectively, of mycelial and sclerotial neck rots, were very occasionally observed. Comparative cultural studies on 13 strains of *B. allii* on agar media revealed no differences of sufficient significance to justify the establishment of physiologic races of the fungus. Infection takes place primarily through the neck tissue, but the scale bases or wounds may also serve as channels of entry. On the outer infected scales the fungus produces a dense grey layer consisting of relatively short conidiophores and innumerable conidia. Sclerotia were commonly formed in or on the older decayed tissue, but did not invariably develop in culture. Although infection was facilitated by wounding the bulbs before introducing the conidia, *B. allii* was experimentally shown to be capable of penetrating the unbroken cuticle of succulent scales. The optimum temperature for the development of neck rot was found to range from 13° to 25° C.

FIKRY (A.). **Watermelon anthracnose.**—*Bull. Minist. Agric. Egypt* 190, 21 pp., 10 pl., 1938.

During recent years anthracnose (*Colletotrichum lagenarium*) *R.A.M.*, xvii, pp. 429, 574] has been a limiting factor in watermelon production every season in Egypt, and in some localities has destroyed the entire crop. The disease appears on the foliage 8 to 10 weeks after sowing and is favoured by high temperatures, spreading slowly in April and May but very rapidly in June and July. The data obtained in a large-scale trial of varieties for resistance showed that susceptibility varied in the very early stage of infection, but later on all the plants became severely affected, a large number of plants in most of the varieties being killed off. Fruit infection (10 to 30 per cent.) occurred mainly on varieties bearing oblong fruits.

When the Chilian Black Seeded variety was sown at weekly intervals from 6th March to 24th April, 3½ months after the first sowing date the consecutive plantings had, respectively, 50, 46, 37, 35, 24, 25, 17, and 6 per cent. infection, but two weeks later all the plantings showed 100 per cent. infection, the severity of which, however, varied with sowing date, infection being slight on the plants sown 7 to 9 weeks, moderate on those sown 11 to 13 weeks, and severe on those sown 12 to 14 weeks. Both as regards temperature and agricultural considerations, March appears to be preferable to April for sowing watermelons.

Of eight fungicides applied to Kleckley Sweet watermelons 7, 9, and 12 weeks after sowing only ordinary dusting sulphur gave satisfactory control, reducing infection to 2 per cent., as compared with 94 to 100 per cent. infection in the other treatments and the control. This result

was confirmed by a further, large-scale test with the Black Seeded variety.

KOVACHEVSKY [KOVAČEVSKI] (I. C.). **Die Braunfleckenkrankheit der Paprikapflanze Cladosporium capsici (March. und Stey.) n. comb.** [The brown spot disease of the Chilli plant, *Cladosporium capsici* (March. & Stey.) n. comb.]—*Z. PflKrankh.*, xlviii, 7, pp. 321–336, 10 figs., 1938.

A brown spotting of the under sides of chilli leaves, starting from the base of the plant and progressing upwards, was first observed by the writer in Bulgaria in 1935 (though believed to have been present for seven or eight years), and was again noticed in another locality in 1936. The circular to oval, velvety lesions, which affected only the foliage, numbered 50 or more on a single leaf and attained a diameter of 3 to 8 mm., occasionally up to 1 or 1·5 cm., frequently coalescing to cover the entire surface. No further appreciable change occurs for some time, but eventually the diseased tissues shrivel and the leaves curl up like a spool before dropping. The fruits ripen prematurely and rapidly become first soft and then mummified, in which state they remain attached to the branches. The only types of chilli showing a fair degree of resistance to the brown spot were those with short, squat fruits, used exclusively for preserving, and a kind with short, pointed, very pungent fruits. The disease is prevalent in the latter part of July, when the dense stands promote the warm, humid atmosphere necessary for its development. The super-luxuriant growth of the plants, which largely contributes to the establishment of infection, is locally ascribed to the regular use of synthetic nitrogenous fertilizers on a naturally rich soil. The economic importance of the brown spot, though not of the first order, is by no means negligible, especially in relation to the preserving and drying industry.

The fungus is characterized by an intercellular mycelium, forming in the stomatal chambers dense, obtusely conical stromata which give rise to sparsely septate, dark brown, straight or slightly curved conidiophores, up to 65 μ high, arranged in fascicles of 50 to 60 with pointed tips, sometimes furnished with denticulate or geniculate lateral swellings; the light to olive-brown conidia, produced singly or in chains, are rod-shaped with tapering, denticulate, or geniculate ends, arcuate, ellipsoid, oval, piriform, or reniform, usually non- or uniseptate, occasionally with up to 5 septa, 10 to 85·5 by 3·2 to 5·2 μ (average 26·5 by 4·2 μ). In culture the fungus grew very slowly, and attained a diameter of scarcely 2 cm. on oatmeal agar after two months. On agar media the colony is coal-black and flat to convex, covered with a brownish-black, loose mycelium, sometimes dense and white in the centre. The submerged mycelium consists of densely woven, brownish-black, thick-walled hyphae, forming a stromatic tissue. The aerial mycelium gave rise to a limited number of conidia identical with those produced on the host. Dark brown, flask-shaped, globular, or conical rudimentary perithecial bodies, up to 85 μ in height and 60 μ in width, were formed in pure culture (e.g., oatmeal agar and sterilized chilli stems and fruits, and tomato stems) and on overwintered chilli leaves, but failed to mature. Inoculation experiments on chilli plants in the greenhouse

with spore suspensions of the fungus from the leaves gave positive results.

From a study of the literature on chilli diseases comparable to the foregoing, it appears that those described under the names of *Cercospora capsici* Marchal & Steyaert [*R.A.M.*, ix, p. 135], *C. capsici* Unamuno [ibid., xi, p. 605], and *Cladosporium* sp. Bensaude [ibid., vi, p. 81] are identical with the disorder under observation, whereas *Cercospora capsici* Heald & Wolf (*Mycologia*, iii, p. 5, 1911) is quite distinct. The Bulgarian chilli fungus presents many analogies both with *Cercospora* and *Cladosporium*, and indeed constitutes one of the transitional forms between the two genera placed by Solheim in *Ragnhildiana* [*R.A.M.*, xi, p. 129]. In consideration of the extreme similarity between the chilli leaf spot and tomato leaf mould caused by *Cladosporium fulvum*, and for other reasons the writer proposes the name of *C. capsici* (March. & Stey.) n. comb. for the agent of the former disease.

Like *C. fulvum*, *C. capsici* is liable to parasitization by a species of *Botrytis* [ibid., xii, p. 713] with trebly branched conidiophores, the uppermost branches bearing very short sterigmata on which are formed globular conidia, 3 to 5 μ in diameter.

Opsomer (J. E.). **De invloed van de mozaïekziekte op de opbrengst van de Cassave.** [The influence of mosaic on the yield of Cassava.]—*Bull. agric. Congo belge*, xxix, 2, pp. 317–322, 1938. [French summary.]

Experiments carried out in the Belgian Congo in 1936–7 showed that the yield of mosaic cassava cuttings [*R.A.M.*, xv, p. 701] was 44·4 per cent. less than that of healthy cuttings. The loss of crop sustained when plantings are made from cuttings that have not been selected may reach 10 per cent. or more, this figure indicating the importance of using only healthy cuttings.

Broekhuizen (S.). **Ziekten en plagen van de Champignonkultuur.** [Diseases and pests of cultivated Mushrooms.]—*Tijdschr. PlZiekt.*, xliv, 3, pp. 113–140, 8 pl., 1937. [English summary.]

In addition to the fungi mentioned in the writer's earlier paper on mushroom [*Psalliota* spp.] diseases in Holland, already noticed [*R.A.M.*, xvi, p. 653], the following organisms are discussed: *Pseudomonas tolaasi* [ibid., xvii, p. 378], found in Brabant, was controlled by reducing the temperature and adequately ventilating the beds, after sprinkling with water, so that no drops of water remained on the mushroom caps. *Dactylium dendroides* [ibid., xiv, p. 346] was found on mushroom beds in a nursery in 1937. *Chaetomium globosum* developed on straw in the compost and *Penicillium* sp. on the casing soil and on slow running spawn. 'Rose comb disease' [loc. cit.] was induced by the use of oil stoves or by the fumes of coal-tar creosote. Rust-coloured spots on the caps were due to irregular humidity either of the compost or of the atmosphere.

Beach (W. S.). **Control of Mushroom diseases and weed fungi.**—*Bull. Pa Dep. Agric.* 351, 32 pp., 6 figs., 1937. [Abs. in *Exp. Sta. Rec.*, lxxviii, 4, pp. 499–500, 1938.]

Investigations by the author demonstrated that mushroom houses can

be made sanitary by fumigation with formalin (3 lb. per 1,000 cu. ft.), by burning flowers of sulphur (2 lb. per 1,000 cu. ft.), or by spraying all inside surfaces with a fungicide. The treatment of the adjacent yards and composting ground with copper sulphate, mercuric chloride, or carbolic acid solutions is also recommended. Deposits of spent compost or waste mushroom fragments must be removed, and, before refilling, the houses that may be infected with diseases or weed fungi should be emptied, cleaned, and disinfected. Harmful fungi in compost are killed by heating to 130° or 140° F. [*R.A.M.*, xvii, p. 379], the installation of fans usually being essential to equalize the temperatures in the top and bottom beds. The soil used for casing should either be sterilized or obtained from uncontaminated sources. The temperature of the bearing beds should be maintained between 55° and 58° [ibid., xvii, p. 430]. An atmospheric humidity of 88 to 90 per cent. is desirable, and excessive moisture must be prevented by ventilation. Surplus moisture in the pinhead and button stages must dry readily if bacterial blotch [*Pseudomonas tolaasi*] and brown spot [cf. preceding abstract] are to be controlled. All good mushrooms in any area where a disease has started should be picked immediately, all infected ones removed, and the area sprayed with Bordeaux mixture (1 1–50 or 2–2–50) or treated with copper-lime dust containing 10 to 15 per cent. of monohydrated copper sulphate.

Control of weed moulds [cf. ibid., xvii, p. 92], especially white plaster mould [*Oospora fimicola*: loc. cit.] and olive-green mould [*Chaetomium olivaceum*: ibid., xvii, p. 379] depends chiefly on correct composting; the nearer the P_H is to neutral, the greater the probability of the spawn outgrowing the moulds.

LAFON (J.). **Étude, préparation et emploi d'un sel de fer efficace contre la chlorose.** [Study, preparation, and use of an iron salt effective against chlorosis.]—*Rev. Vitic., Paris*, lxxxix, 2300, pp. 65–68, 1938.

Chemical studies have shown that citric acid increases the controlling effect of iron sulphate on lime-induced vine chlorosis [*R.A.M.*, xvii, p. 291] by preventing the oxidation of ferrous sulphate to ferric, which is insoluble and thus unavailable to the plant; experience has further shown that standing for a few days improves the efficacy of the iron sulphate-citric acid solution, and that the action of the citric acid on iron sulphate is favoured by exposure to daylight. A concentrated solution of 1 part citric acid to 5 parts iron sulphate (by weight) may be evaporated in sunlight during summer, and the resulting residue, in the form of very fine, slightly green crystals, can be stored for use in the winter, when, re-dissolved, it is ready at once for application to pruning wounds.

BONNET (A.). **Chronique. Traitement d'été des Vignes chlorosées.** [Current notes. The summer treatment of Vines affected with chlorosis.]—*Progr. agric. vitic.*, cix, 26, pp. 585–587, 1938.

The author obtained favourable results in 1937 in the treatment of vines against chlorosis by the application of 1 per cent. iron sulphate with 150 gm. citric acid per hectol. [see preceding abstract]. The spray is intended for vines not treated in winter or not benefited by such

treatment. It should be applied early in the summer, as soon as the first signs of discoloration appear, in which case the leaves begin to regain their normal colour in a few days. A second application should suffice to enable the leaves to regain complete normality; if, however, treatment is delayed until the leaves are quite yellow, the effects are only partial, and very slow.

BRANAS (J.). **Sur le court-noué. État actuel de la question.** [Note on court-noué. The present state of the problem.]—*Progr. agric. vitic.*, cx, 28, pp. 25–31, 1938.

The author states that all the evidence so far accumulated points to court-noué being the final stage of a virus disease of the vine, the initial stages of which are for the most part overlooked by the growers, chiefly owing to the fact that the precursory symptoms, such as 'panachure' [variegation] of the foliage, asymmetrical development and other malformation of the leaves, fasciation, and general disturbance of the normal phyllotaxy of the vine, have hitherto been regarded as physiological troubles or teratological phenomena. Before the introduction of *Phylloxera* [*vastatrix*: *R.A.M.*, xvii, pp. 222, 653] court-noué was rare and of no economic importance in Europe, since its distribution could only be brought about by cuttings from affected vinestocks, which were instinctively avoided by the cultivators; since then, however, the disease has been rapidly gaining ground and is now becoming one of the gravest menaces to viticulture in Europe. In his opinion the only means of controlling the disease is the careful extirpation of all infected and neighbouring healthy stocks to a distance sufficient to prevent the migration of the *Phylloxera* through the soil, all diseased material being immediately incinerated *in situ*. The soil thus cleared should be kept free from vine growth and either fallowed or used for non-susceptible crops for a period of years which still remains to be determined, but should not be less than three or four. Practice has shown that the control measures now in use, such as applications of carbon disulphide or flooding are either too expensive or only partly effective. State supervision of commercial vine nurseries is advocated to ensure that only healthy planting material is supplied by them.

MOREAU (L.) & VINET (E.). **La pression osmotique de la sève et les symptômes du court-noué chez la Vigne.** [Osmotic pressure of the sap and court-noué symptoms in the Vine.]—*C.R. Acad. Agric. Fr.*, xxiv, 21, pp. 709–714, 1938.

Volumetric measurements of the sap exuded by 18 vine stocks suffering from court-noué in the Angers district of France, where the disease may be due either to *Pumilus medullae* [*R.A.M.*, xvii, p. 432] or to adverse soil conditions, revealed a lowering of the osmotic pressure to an extent ranging from 2·5 to 68 in comparison with the normal figure, arbitrarily fixed at 100. Some suggestions are made for raising the osmotic pressure of the sap by cultural methods.

MARSAIS (P.). **Les maladies dues aux Botrytis et la viticulture.** [The diseases caused by *Botrytis* spp. and viticulture.] *Rev. Vitic., Paris*, lxxxix, 2303, pp. 145–148, 1938.

The author states that during the spring of 1938 considerable losses

were caused to young grafted vine plants in many French nurseries by a rot of the graft union tissues and young shoots, which is believed to have been caused by species of *Botrytis*. The main source of infection is thought to be the soil of the graft layering beds; it is recommended that such beds should be thoroughly disinfected before use, and that the rooted cuttings should be treated immediately on removal from them with some fungicide (e.g., 5 per cent. potassium sulphocarbonate for 30 minutes, or ortho-oxyquinoline) followed by washing in water.

Department of Scientific and Industrial Research. Report of the Food Investigation Board for the year 1937.—266 pp., 4 diags., 71 graphs, 1938.

The following are among the items of phytopathological interest in this report. In connexion with a study on egg moulds [cf. *R.A.M.*, xvii, p. 322], R. G. Tomkins found that the growth of *Rhizopus nigricans* on 2 per cent. malt agar at P_H 5 and on the same medium adjusted to 3·6 is reduced as the carbon dioxide concentration is raised. Growth on an alkaline medium is initially increased by the presence of small concentrations of carbon dioxide; on 2 per cent. malt agar+0·01 per cent. sodium bicarbonate, for instance, the development of the fungus is stimulated by carbon dioxide up to 10 per cent. and is about the same when 30 per cent. is present as in air. *R. nigricans* does not ordinarily grow on 2 per cent. malt agar+0·05 per cent. sodium bicarbonate, but will do so in the presence of 5 per cent. carbon dioxide. The maximum growth rate of the mould on this medium occurs with an admixture of 20 per cent. carbon dioxide. The practical interest of these data is that storage in concentrations of carbon dioxide up to 20 per cent. may, under certain conditions, encourage rather than inhibit mould growth.

T. Moran's experiments revealed no correlation between velocity of air current and the rate of mould growth on eggs, the latter being entirely dependent on the relative humidity of the atmosphere. At 95 per cent. perceptible infection became apparent after 27 days in both still and moving air (circulated at a uniform speed of 17 m. per minute), while at 90 per cent. the corresponding periods were 48 and 50 days, respectively.

F. Kidd and C. West found that a storage temperature range of 60° to 70° F. is the least conducive to breakdown in William's Bon Chrétien pears, while a high incidence of the trouble (54 per cent.) was observed after 173 days at 50°.

In experiments by A. S. Horne and R. G. Tomkins on the relation between resistance, mortality, and spore load in three lots of apples (from the Fen district, Kent, and the west of England), the addition of *Penicillium expansum* [ibid., xvii, p. 689] spores did not in any case increase wastage, the more extensive infection by this fungus being offset by a corresponding reduction in other rots.

Experiments by R. G. Tomkins showed that the amount of wastage from *P. digitatum* in wounded oranges (6 to 10 pricks to a depth of 1 mm. with pins stuck through a cork) may be reduced and retarded by storage in a reasonably dry atmosphere (70 per cent. relative humidity at 18° C.) [ibid., xiii, p. 112] or by ventilation with sufficiently dry air (50 per cent. saturation) as compared with saturated conditions. Within wide limits the rate of ventilation with saturated

air does not affect wastage. Restricted ventilation, allowing the accumulation of carbon dioxide up to 5 per cent. and simultaneously inducing conditions approaching saturation, does not increase wastage as compared with saturated air storage. The addition of 10 per cent. or more carbon dioxide may increase wastage by *P. digitatum* (up to 100 per cent. after 36 days in one test on South African Navels), while the introduction of 20 per cent. into the atmosphere is liable to cause browning of the skin and bitterness of flavour. Similar though less conclusive results were obtained in experiments on sound oranges.

A. S. Horne's experiments (with J. Colhoun) on variations in the reaction of the apple to fungal invasion associated with locality showed the average penetration of *Penicillium* (English isolation) through the lenticels following inoculations in December and February to be nearly three times as high (72·7 per cent.) for Kentish Bramley's Seedlings as for the same variety from Ulster (26·5), the corresponding figures for *Botrytis* (Irish culture) being 28·5 and 4, respectively. The *Penicillium* and *Botrytis* spots developed 5 and 15 days later, respectively, on the Ulster than on the Kentish fruit. In a later (March) test with *Botrytis*, the average penetrations for Kent and Ulster fruit were 30 and 14 per cent., respectively. In inoculations through punctures *Penicillium* spots developed in every case within 4 to 10 days. Similar results were obtained with *Botrytis* on Kentish fruit, but only 61 per cent. of the inoculations on Ulster apples were successful, developing after an average of 12 days. In a March test a higher value (83 per cent.) for *Botrytis* invasion was secured on Ulster fruit. As regards radial advance of *Penicillium* through the lenticels, the November and February averages for Kent were 0·675 and 2·332 mm. per diem and those for Ulster 0·405 and 1·482, respectively, the resistance of the Kentish fruit thus decreasing more rapidly with the passage of time than that of the Ulster samples.

In tests by the same author (with W. A. Roach), fruit from Bramley's Seedling trees injected with solutions of sodium phosphate, urea, sodium phosphate and urea, glucose and urea, and fructose and urea, was inoculated with *Cytosporina ludibunda* [ibid., xiv, pp. 40, 453]. The initial resistance to the fungus of the trees treated with sodium phosphate was not maintained. In general, urea tended to increase susceptibility, but in combination with fructose it produced anomalous results. Some indication was obtained that the result of the treatments is partially dependent on the time of application, the adverse effects of urea being more pronounced in fruit from trees injected in July than in August. The rate of invasion by *C. ludibunda* increased during 153 days' storage at East Malling by over 100 per cent., the difference of means between October (0·297 mm. per diem) and March (0·684) being $0{\cdot}387 \pm 0{\cdot}031$, and extremely significant.

J. Barker's studies on the storage of hothouse grapes showed that the Colmar variety is more susceptible to [unspecified] rots than the English Muscat. After a fortnight at ordinary temperature bunches picked on 11th November showed 10 per cent. decay, whereas those kept at 34° F. (with water-feeding) for a month and then at ordinary temperature for a fortnight, or for six weeks at 34°, were in good condition. English muscats stored at 34° with water-feeding kept well

for seven weeks but were slightly yellow after ten, while at ordinary temperature rotting progressed rapidly. Picking some time before maturity reduced the amount of storage rot in both varieties.

Padwick (G. W.). **India : new plant diseases recorded in 1937.**—*Int. Bull. Pl. Prot.*, xii, 6, pp. 122–123, 1938.

The following plant diseases were observed for the first time in India in 1937: apple, eggplant, and peach rots due to *Rhizopus arrhizus*, *Phytophthora parasitica* [*R.A.M.*, xv, p. 633], and *Aspergillus japonicus* [ibid., xiv, p. 334], respectively, *Rhizoctonia bataticola* [*?Macrophomina phaseoli*] on orange roots [ibid., x, p. 308], and heart rot of *Picea morinda* (*Trametes pini*).

Conners (I. L.). **Seventeenth Annual Report of the Canadian Plant Disease Survey, 1937.**—xi+87 pp., 1938. [Mimeographed.]

In 1937 wheat stem rust (*Puccinia graminis*) caused heavy damage in the south-central and south-eastern parts of Manitoba, but injury was slight in other districts of western Canada [cf. *R.A.M.*, xvi, p. 589]. Infection appeared during the last few days of June, and spread rapidly throughout Manitoba and Saskatchewan, but severe drought prevented its further development.

Leaf blotch (*Helminthosporium tritici-repentis*) [ibid., xiv, p. 90; xvi, p. 231] caused a severe leaf wilt and spotting on durum wheat near Melita, Manitoba, this being the first record of the fungus on wheat in Canada.

A species of *Cryptoascus* was observed on wheat roots in Prince Edward Island in 1936 and 1937; it was also found on barley and oats.

Browning root rot of wheat (*Pythium* spp.) [ibid., xv, p. 639; xvii, p. 735], an important disease in Saskatchewan, occurred in severely epidemic form for the first time in Manitoba, being destructive to wheat on summer fallow in the Dauphin, Gilbert Plains, Grandview, Roblin, and Russell areas in June.

Red clover [*Trifolium pratense*] in New Brunswick was affected by mid-vein spot (*Mycosphaerella carinthiaca*) [ibid., i, p. 422; xvi, p. 229] in 1936, a new record for Canada, and probably for North America; *Ramularia trifolii* is the conidial stage.

Violet root rot (*Rhizoctonia crocorum*) [*Helicobasidium purpureum*] was recorded for the second time in Canada, when two affected potato tubers were received from Alberta; the disease occurred in only a few hills. Potato tubers apparently affected with dry rot (*Fusarium solani* var. *eumartii*) [cf. ibid., xvii, p. 700] were received from south-western Ontario; definite information that the disease had also occurred in 1936 was obtained, but the disease has not been recorded before in Canada. In the Prairie provinces potatoes are affected by a wilt of unknown cause characterized by the margins of the leaves on the upper parts of the plants becoming purple. It appears to be very similar to the wilt reported from Minnesota and Wisconsin [ibid., xvii, p. 409; cf. also xvii, p. 700]. Yellow dwarf [ibid., xvii, p. 701] was noted in Middlesex County, Ontario, chiefly on Dooley potatoes; the disease had been present for a few years.

A tomato disease, the symptoms of which agreed perfectly with Reddick's description (*Phytopathology*, x, pp. 528–534, 1920) of stem

girdle (*Phytophthora? parasitica*), was found in a greenhouse at Grimsby, Ontario, this apparently being the first record of the disease in Canada.

Other new records for Canada include *Thyrostoma compactum* fruiting on dead elm twigs [ibid., xvi, p. 70] from Quebec and Ontario, a species of *Taphrina* very similar to *T. polyspora* found fruiting on leaves of *Acer rubrum* in Ontario, leaf spot (*Phytomonas geranii*) of *Geranium sanguineum* [ibid., xvi, p. 612] at Winnipeg, a virus-caused leaf curl of *Pelargonium* in Ontario [ibid., xvii, p. 684] (probably present for ten years), ink disease (*Mystrosporium adustum*) on the Imperator variety of iris [ibid., xv, p. 583] in British Columbia, *Coryneum microstictum* on roses [ibid., xvii, p. 323] in Ontario in 1929, and *Peronospora sparsa* on several varieties of roses [see next abstract] in British Columbia. Additional collections of *Coleosporium campanulae* on *Campanula* [ibid., xvi, p. 589; xvii, p. 602] were made in Ontario and Nova Scotia.

Eastham (J. W.). **Report of Provincial Plant Pathologist.**—*Rep. B.C. Dep. Agric., 1937*, pp. K43–K51, 1938.

During 1937 the only new disease of importance recorded in British Columbia was rose downy mildew (*Peronospora sparsa*) [*R.A.M.*, xvii, p. 752].

In a varietal resistance test the following winter wheats were strongly resistant to bunt [*Tilletia caries* and *T. foetens*] inoculum from the Okanagan valley: Albit×Hohenheimer, Hohenheimer×White Odessa 130 and 135, Hybrid 128×White Odessa, Hymar, Rex, Triplet× White Odessa, White Odessa×Hard Federation, and White Odessa× Dickkopf. Hussar and Oro, for many years very resistant, had 8·7 and 6·3 per cent. infection, respectively. That the Relief variety had 61·2 per cent. infection indicates that a new physiologic form has appeared in Northern Okanagan.

Locally, winter (not spring sown) wheats become infected by soil-borne spores, this form of infection being largely responsible for the bunted crop in 1937 and other years. Losses may be reduced by (1) seed treatment with ceresan, copper carbonate (50 per cent.), and leytosan; (2) early seeding (since bunt is reduced when the temperature from the day the wheat is seeded until it reaches the soil surface is over 55° F.), seeding in August or the first two weeks of September giving better control than seeding from 15th September to 15th October; (3) late seeding after 15th October; (4) delayed seeding three to four weeks after the first heavy autumn rains; (5) seeding before threshing time, which in the Okanagan valley gives virtually complete control; (6) substituting chemically treated spring wheat; and (7) growing resistant varieties of winter wheat, such as the fairly resistant Ridit, Oro, Hussar, White Odessa, and Jenkins×Ridit, though these will become affected in time and will require to be replaced.

Further tests again showed that Bordeaux mixture is slightly more effective against apple anthracnose [*Neofabraea malicorticis*: ibid., xvi, p. 797] than bouisol (4·5 pts. per 100 gals.).

Milbraith (D. G.). **Bureau of Plant Pathology.**—ex *Rep. Calif. Dep. Agric., 1937* (*Bull. Dep. Agric. Calif.*, xxvi, 4), pp. 533–539, 1938.

During 1937, the enforcement of celery-free periods in the vicinity

of Venice, California, as a means of controlling celery western mosaic [*R.A.M.*, xvi, p. 730], gave further improvement in yield, the quality of the crop being equal to normal.

Since the beginning of the eradication campaign against peach mosaic [loc. cit.; ibid., xvii, p. 301] in 1936, 62,401 diseased trees have been found and 32,009 diseased and 137,167 abandoned trees have been removed. On 1,717 properties inspected both in 1936 and 1937, there were 26,567 diseased trees in the former year, and 26,260 new infections in the latter, representing an apparent spread of 98·8 per cent., and probably an actual spread of at least 75 per cent.

Blight [*Endothia parasitica*: ibid., xvi, p. 730] was found in the two chestnut plantings previously reported as affected. There was a marked preponderance of infections at the base of the trunks near ground-level and spread apparently occurred through the irrigation water. There is no doubt that a general, mass infection took place in 1934–5, when several large, sporulating, aerial cankers were noted. Infection readily arose from these in the outer bark, where, under Californian conditions, it spreads very slowly, so that the cankers found in 1937 were probably held-over, quiescent infections. Eradication is in progress.

Chargaff (E.) & Levine (M.). **The lipids of Bacterium tumefaciens.**—*J. biol. Chem.*, cxxiv, 1, pp. 195–205, 1938.

Full details are given of the procedure adopted by the authors in their study at the Montefiore Hospital, New York, of the composition of *Bacterium tumefaciens* [*R.A.M.*, xvi, p. 798] and the results obtained in the isolation of fat, phosphatide, and polysaccharide fractions from the organism are described. The fat fraction was found to consist of glycerol, sterols, palmitic and oleic acids, a new saturated liquid acid, and a complex mixture of higher unsaturated fatty acids.

Locke (S. B.), Riker (A. J.), & Duggar (B. M.). **Growth substance and the development of crown gall.**—*J. agric. Res.*, lvii, 1, pp. 21–39, 5 figs., 1938.

The results of experiments, in which tomato, *Sedum*, *Bryophyllum pinnatum*, and *Kalanchoë diagremontiana* plants were inoculated with single-cell sister crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) cultures, showed that the plants inoculated with the virulent strain of the organism exhibited, in addition to development of galls, (1) increased epinasty of leaf petioles, (2) increased initiation of adventitious roots, (3) stimulated cambial activity, (4) inhibited development of certain buds, and (5) delayed abscission of senescent leaves, responses suggesting an increase in the amount of growth substances present [ibid., xvii, p. 659]. An attenuated sister strain was less effective in inducing most of these reactions, as well as in bringing about gall development. Inoculation of decapitated tomato plants on the wound surface with the attenuated culture stimulated the development of adventitious shoots. Determinations by Went's *Avena* tests (*Rec. Trav. bot. néerland.*, xxv, pp. 1–116, 1928) indicated that the tissues of inoculated tomato seedlings contained greater amounts of growth substance than the comparable tissues of uninoculated seedlings, but the amounts detected were equivalent to only a minute fraction of the amount commonly

used in the β-indoleacetic acid treatment for the production of proliferations in the bean [*Phaseolus vulgaris*]. In preliminary experiments no relation could be established between the ability of the virulent and attenuated cultures to produce growth substance in culture and their ability to induce galls in plants. In experiments on tomato plants growth substance from expanding leaves slightly stimulated the development of the galls induced by the attenuated strain, while that from gall tissue induced by the virulent strain had a strong stimulating effect on tissue inoculated with the attenuated strain. *B*-indoleacetic acid was only slightly effective in this respect.

Reviewing the available evidence the authors reserve judgement about β-indoleacetic acid playing a major part in the development of crown gall. The chief growth substance so far detected in crown gall is more probably of the auxin-a or auxin-b type than of the heteroauxin type and is more likely a product of the host cells under the influence of the bacteria than a direct bacterial metabolic product.

Magrou (J.). **Contribution à l'étude de l'immunité humorale chez les plantes.** [A contribution to the study of humoral immunity in plants.]—*Ann. Inst. Pasteur*, lx, 6, pp. 565–600, 2 pl., 1938.

A detailed, fully tabulated account is given of the writer's experiments at the Pasteur Institute, Paris, to determine the nature of the humoral reactions of plants inoculated with *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xvi, p. 660; xvii, p. 448].

The expressed juice of *Pelargonium zonale* and *Chrysanthemum frutescens* tumours induced by the crown gall organism was found invariably to effect complete agglutination of aqueous suspensions of pure cultures of the bacterium at dilutions of up to 1 in 10,000 in the case of the latter plant. In four out of five tests the same phenomenon was produced by the juice of the leafy stems of these two plants. Juice from uninoculated *P. zonale* and *C. frutescens* plants also agglutinated *Bact. tumefaciens*, but only within a very restricted range of dilutions. The juices lose their agglutinative capacity on heating to 100° C. *P. zonale* and *C. frutescens* juices, whether extracted from tumours, tumour-bearing stems, or healthy plants, do not agglutinate *Phytomonas* [*Bact.*] *malvacearum*, *P.* [*Bact.*] *flaccumfaciens*, *P.* [*Bact.*] *mori*, or *Erwinia carotovora*. Extracts of all these organisms, as well as of *Bact. tumefaciens*, are precipitated by the juice of tumours and tumour-bearing stems of *C. frutescens*, but not by that of healthy plants. The power of precipitation is attenuated by heating to 85°. The juice of *Pelargonium zonale* tumours also precipitates extracts of *Bact. tumefaciens*, but less thoroughly and constantly than that of *C. frutescens*.

P. zonale plants bearing developing crown gall excrescences are stated to be partially or totally immune from reinfection by the same organism, but their freedom from invasion by *Bact. tumefaciens* is accompanied by hypersensitivity assuming the form of local or generalized intoxication.

It is evident from these data that crown gall infection involves a general modification in the internal constitution of the plant which can be studied by the aid of serological methods [ibid., xvi, p. 660]. The phenomena of bacterial agglutination and precipitation of their ex-

tracts by the diseased plant juices are considered to present analogies with the immunological reactions observed under comparable circumstances in the animal world. Agglutinins may already be present in uninfected plants, but if so their properties are modified by the first inoculation with antigen. On the other hand, precipitins are discernible, at any rate by the current methods of technique, only in infected plants. The existence of antibodies is revealed *in vivo* by the state of hypersensitivity accompanying immunity from reinfection in inoculated plants.

DAME (F.). **Pseudomonas tumefaciens (Sm. et Towns.) Stev., der Erreger des Wurzelkropfes, in seiner Beziehung zur Wirtspflanze.** [*Pseudomonas tumefaciens* (Sm. & Towns.) Stev., the agent of crown gall, in its relation to the host.]—*Zbl. Bakt.*, Abt. 2, xcviii, 21–24, pp. 385–429, 18 figs., 1938.

Contrary to E. F. Smith's observation (Bacterial diseases of plants, p. 413, 1920) that the proliferations induced by *Pseudomonas* [*Bacterium*] *tumefaciens* originate in a single cell of the host, the writer's inoculation experiments with the crown gall organism on sunflower (*Helianthus annuus gigantea*) at the Horticultural Institute of the Friedrich Wilhelm University, Berlin, showed that several cells are invariably involved in the inception of the tumours, even when only one is wounded.

In experiments on Flageolet St. Andreas beans [*Phaseolus vulgaris*], Lucullus tomatoes, sunflowers, apple and pear seedlings, and *Datura*, tumour-like proliferations were induced by minute quantities of β-indoleacetic acid and β-indolebutyric acid [*R.A.M.*, xvii, p. 658]. At higher concentrations (e.g., 0·5 per cent. and upwards) these substances stimulated the vigorous development of adventitious roots, a result conflicting with the observations of Nellie A. Brown and Gardner in this respect [ibid., xv, p. 782; xvii, p. 224]. Similar manifestations of a less pronounced character followed the inoculation of bean, *Datura*, and tomato plants with ether extracts from tumours and cultures of *Bact. tumefaciens* (Stapp's *Dahlia variabilis* strain) [ibid., xvi, p. 302]. These excrescences arose from the cambial tissue, whereas those due to direct inoculation with the organism at first involved only the injured and adjacent cells.

Hormone formation was found to be an exclusive property of virulent strains of *Bact. tumefaciens* [cf. above p. 799], such as Smith's from hops, Stapp's from *D. variabilis*, and the writer's from apple. The phenomenon was stimulated by the incorporation in the medium of high-molecular nitrogen compounds, especially tryptophane.

A limited degree of immunization was obtained in tests on *Datura* and tomato by infiltration (by means of glass tubes drawn out to a capillary and inserted in the stem) with suspensions of an avirulent strain of *Bact. tumefaciens* (Riker's from blackberry) or rabbit antisera (1 : 1 and 1 : 5).

In a series of tests on the reaction of a large number of apple, pear, and quince strains used as nursery stocks to infection by the uniformly virulent hop isolation of the crown gall organism, a marked degree of resistance was shown by the Northern Spy apple variety, three

clones (Dab 104, 114, and 400) of *Malus* [*Pyrus*] *baccata* var. *aurantiaca*, and three of the quince types (E[ast] M[alling] B, F, and G), but all the pear clones were susceptible.

POUND (F. J.). **Cacao and witchbroom disease (Marasmius perniciosus) of South America. With notes on other species of Theobroma. Report by Dr. F. J. Pound on a visit to Ecuador, the Amazon Valley, and Colombia. April 1937–April 1938.**—58 pp., 1 map, Youille's Printerie, Port-of-Spain, Trinidad, 1938.

The writer gives an account of his visits to Ecuador [*R.A.M.*, xvii, p. 99] and later to the Amazon Valley in search of strains of cacao resistant to the witches' broom disease (*Marasmius perniciosus*) [ibid., xvii, p. 728]. The disease was found to be rampant throughout the whole of the Amazon Valley, including the tropical plain drained by the headwater tributaries, extending into Bolivia, Peru, Ecuador, and Colombia. In Ecuador the high-grade 'Nacional' cacao was found to be susceptible to the disease; the 'Venezuelan' cacao introduced from Trinidad about 1890 seemed on the whole to be equally susceptible to witches' broom (and also to *Monilia* [*roreri*: ibid., xiii, p. 360]), yet occasional 'Venezuelan' trees developed resistance. On the whole there exist in Ecuador well over 1,000,000 resistant cacao trees and the resistance seems to be often linked with the white pod type of tree.

In the Amazon Valley, on the Rio Nanay 14 trees all of the same type with either completely unpigmented or half white, oval, only slightly warty pods were found to be entirely free from disease, in spite of heavily infected trees growing near them. The strong resemblance of the pods of these trees to those of the above-mentioned resistant type of tree in Ecuador suggests the possibility of the latter trees being of Amazon Valley origin. Occasional resistant trees were found to belong to a type designated 'lagarta', with long, warty, bottle-neck pods, or to a third group, characterized by small, oval, warty pods. On the Rio Marañon some twenty trees free from disease had the 'lagarta' type of pod, either full white or pure green. On the Rio Ucayali only the green 'lagarta' type occurs and was also found to segregate resistant trees. In the Belem district and Rio Tocantins cupuassu trees (*Theobroma grandiflorum*) were observed to be very heavily infected by the disease whereas cacao trees (of a type labelled 'Para', characterized by an unpigmented half blanco pod, with a bottle-neck, long, oval body, warty surface, and a definite point) were reasonably free from infection except when growing in their vicinity. Many young cacao trees of this type grown in full sunshine were observed to remain uninfected, while those growing in shade showed some disease. Cacao trees of a type known to be susceptible were found to be healthy at altitudes of over 3,000 ft. in the Colombian Cordilleras, while for ten years the disease has been known to occur on the coastal plain around Tumaco not far distant. The high altitude would therefore appear to have prevented the development of the disease unless one assumes that it has been shut off by the mountain barrier. Of the varieties of non-commercial cacao described the self-compatible *T. speciosum* group appears to be immune from witches' broom and also from *Phytophthora faberi* [*P. palmivora*].

Pods and budwood of suspected highly resistant cacao types and of immune non-commercial varieties collected on this journey have been sent to Barbados for propagation in quarantine, with a view to being budded later on seedlings in Trinidad and submitted to further tests and studies.

GRACE (N. H.). **Effect of phytohormones on seeds damaged by formaldehyde and other disinfectants.**—*Canad. J. Res.*, Sect. C, xvi, 8, pp. 313–329, 1 pl., 1938.

An account is given of experiments made to test the hypothesis recently advanced by A. W. Henry (*20th Ann. Rept.* (*1936–7*) *Nat. Res. Counc. Canada*, p. 85, 1938) that the deleterious effect of formalin disinfection on the germination and growth of cereal seeds is due, in part, to the tendency of formaldehyde to inactivate the growth hormone, heteroauxin. In his experiments the author tested the effect of the addition of two plant hormones, namely, 1-naphthylacetic acid or 3-indolylacetic acid, to the formalin or copper sulphate solutions or to hot water, used for the disinfection of a number of cereal seeds, including low-grade commercial wheats. The results showed that the injury to the seeds, as measured by percentage germination and by the relative length of the seminal roots and stems, is largely overcome by the addition of either substance, the optimum concentration of the hormone varying for individual varieties of cereals between 0·01 and 5 parts per million (by weight). Higher concentrations of the hormone may bring about a significant drop in the useful effect of the treatment, indicating the overdosage phenomenon characteristic of plant response to these active chemicals. There was also evidence that improvement in germination and early growth from the use of formaldehyde-hormone solutions is independent of the polymer content of the formaldehyde, and that the formaldehyde-hormone solutions may be stored for at least 10 weeks without loss of activity.

The results of a further series of experiments suggested that the response of formaldehyde-injured seeds to chemicals may be used to determine the physiological activity of the latter. Among the substances tested with No. 5 special wheat, the greatest reduction in damage was effected by naphthylbutyric acid, phenylacetic acid gave somewhat less protection, vanillin and methoxysalicylaldehyde were intermediate in effect, and benzoic acid and piperonal showed activity of a lower order. Pyrroleacetic acid appeared to have no effect.

[A brief summary of this paper is published in *Nature, Lond.*, cxlii, 3584, p. 77, 1 fig., 1938.]

DÉFAGO (G.). **Pour une meilleure connaissance et un contrôle plus efficace de la carie du Blé en Suisse romande.** [For a better knowledge and more effective control of Wheat bunt in Romansh Switzerland.]—*Bull. Murith.*, lv, pp. 78–116, 1 fig., 1 graph, 1938.

Inoculation experiments with collections of spores of wheat bunt (*Tilletia tritici*) [*T. caries*] from various parts of Romansh Switzerland, where the disease has recently become active, showed that all the chief

spring and autumn varieties grown in this locality are highly susceptible, except the somewhat resistant Alpha and Plaine.

The collections of *T. caries* obtained from the different areas were found to represent 'populations' differing in pathogenicity, specialization, colour, and length of basidiospore, but not in the dimensions of the chlamydospores or the modifications produced in the host. The 'populations' consisted of heterogeneous mixtures of individuals which hybridized before penetrating the host. These individuals fell into distinct groups differing in virulence and in spore colour and shape. Such groups remained relatively constant. Infections with mixed populations gave rise to less bunt than inoculations with separate populations, indicating that high virulence is recessive in *T. caries*. Haploid isolations were distinguished from one another by fairly constant cultural characters, which were not, however, specific for any one population. Chlamydospore germination was greatly increased by abrupt changes in temperature, which may partly explain why sowings made late in autumn or early in spring are most liable to infection. The optimum temperature for *T. caries* in culture was about 21° C., and that for *T. foetens* about 18°, the maximum for both species lay between 24° and 27°, the minimum being less than 0° for *T. caries* and between 0° and 3° for *T. foetens*. The fact that *T. foetens* is restrained by low temperatures more markedly than *T. caries* may explain why the former is found especially in warm countries and continental countries sowing almost exclusively spring wheats.

Seed treatment with formalin (0·1 per cent., 20 minutes' immersion) alone gave a completely disease-free crop without impaired germination; dusting, except with organic mercury dusts, gave less beneficial results.

GUARD (A. T.). **Studies on cytology and resistance to leaf rust of some interspecific and intergeneric hybrids of Wheat.**—*Amer. J. Bot.*, xxv, 7, pp. 478–480, 2 figs., 1938.

In these studies hybrids between Chinese wheat C.I. 6223 (*Triticum vulgare*), which is very susceptible to leaf [brown] rust (*Puccinia triticina*), and the highly resistant species Vernal emmer S.D. 293 (*T. dicoccum*), Abbruzzes rye (*Secale cereale*), and *S. montanum*, respectively, were grown in the greenhouse and inoculated in the seedling stage with *P. triticina* (physiologic race 65). Of the 24 lines from crosses between Chinese wheat (haploid chromosome number 21) and Vernal emmer ($n = 14$), selected in the third generation and studied in the fourth and fifth, 7 lines had a haploid chromosome number of 14 and 17 a haploid chromosome number of 21. All lines with 14 chromosomes were as resistant to brown rust as the pollen parent; of those with 21, 11 were resistant and 6 highly susceptible. The hybrid between Chinese wheat and an inbred self-fertile strain of Abbruzzes rye ($n=7$) was an amphidiploid and was highly resistant. The fertility of the plants of the F_3 and subsequent generations varied from 5 to 75 per cent., depending largely on environmental conditions, especially at the time of flowering. Meiosis showed only minor irregularities. Fifteen F_1 hybrids between Chinese wheat and *Secale montanum* ($n=7$)

were sterile. All F_1 plants were highly resistant. Meiosis was very irregular and no viable pollen was produced.

HOLTON (C. S.). **A simple method of inoculating Wheat seedlings with paired monosporidial lines of Tilletia tritici and T. levis.**—*Phytopathology*, xxviii, 7, pp. 518–520, 1 fig., 1938.

The following technique, based on Buller and Vanterpool's observation of the violent discharge of the basidiospores (secondary conidia) of *Tilletia tritici* [*T. caries*: *R.A.M.*, xii, p. 777], has been devised for the simple and expeditious inoculation of wheat seedlings with paired monosporidial lines of this fungus and *T. levis* [*T. foetens*]. A fragment of mycelium from each of the two lines to be combined is placed near the edge of a Petri dish containing potato dextrose agar. As soon as growth starts, the dish is turned on edge, with the side bearing the mycelial colonies uppermost, and incubated in this position at 10° to 18° C. As growth proceeds, the secondary sporidia are discharged, and, coming to rest on the agar, form a mycelium, which in turn gives rise to more sporidia. A part of the agar surface thus becomes covered with the sporidia and mycelium of the two lines and is ready for use as inoculum. Surface-sterilized wheat grains are placed on moist sterile filter paper in the inverted lid of the Petri dish and covered with the inverted culture; the whole is then incubated at 10° for 10 to 14 days, during which time the secondary sporidia fall on the seedlings and germinate. At the end of the period of incubation the seedlings are transplanted, preferably as a group, to the greenhouse or field. In one of the series of inoculations made by this method during the last two years, 26 out of 74 monosporidial line combinations produced 1 to 57 per cent. infection (over 20 per cent. in most cases).

CHURCHWARD (J. G.). **Studies on physiologic specialization of the organisms causing bunt in Wheat, and the genetics of resistance to this and certain other Wheat diseases. I. Physiologic specialization studies.**—*J. roy. Soc. N.S.W.*, lxxi, pp. 362–384, 3 figs., 1938.

In the experiments described in this paper 16 collections of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] from widely separated centres (nine from Australia, six from the United States, and one from Wales) were studied on 11 varieties of wheat at St. Paul, Minnesota, in 1932. Four of the wheats, Kota, Progress, Preston, and Red Bobs, acted as differentials and these were used in repeat inoculations at Hawkesbury Agricultural College, New South Wales, in 1933. The percentage infection was calculated from about 200 head counts and the results are tabulated. In addition to the races of *T. caries* described by Reed, three others appear in the Australian collections and four of *T. foetens*.

Of the new races of *T. caries*, race 1 is able to infect Kota, Progress, and Red Bobs wheats, the first-named being the most susceptible. In 1932 it produced a reaction similar to that of Reed's T_2 collection [*R.A.M.*, vii, p. 369] but in 1933 it differed in attacking Preston more severely. Race 2 infected only Kota and race 3 attacked Kota, and to some extent Progress, Preston (in 1933 only), and Red Bobs (1933). Of the new races of *T. foetens* race 1 infected Red Bobs, and to a less extent

Progress; race 2 was weakly parasitic on Kota; race 3 infected Kota, and to a less extent Red Bobs and Progress; and race 4 infected Kota, and to a less extent Progress, but not Red Bobs. No differences were observed in the size of the chlamydospores or in the size, shape, and consistency of the bunt balls, or in the cultural characters of the various collections.

In 1935–6, the experiments were continued, using the seven new Australian races and 72 collections of bunt from different parts of the world. The reactions of the differentials were similar to those obtained with the same races used in the earlier tests, with three exceptions: in 1935, Preston was not attacked by T_2 or race 3 of *T. caries*, but in 1936 was heavily infected by them. Progress, attacked by T_1 in 1936, had a relatively small percentage of bunt in 1935. Of the 72 collections from places outside Australia, 41 gave constant reactions and 31 were variable. The 41 collections fell into 11 groups according to the reactions of the four differential varieties. Of the Australian races established in the earlier experiments, however, races 1, 3, and 4 of *T. foetens*, and race 3 of *T. caries*, corresponded, respectively, to types 1, 9, 4, and 6 already described.

Hynes (H. J.). **Studies on Helminthosporium root-rot of Wheat and other cereals. Part 3. Factors influencing infection. Part. 4. The control problem.**—*Sci. Bull. Dep. Agric. N.S.W.* 61, 67 pp., 15 figs., 2 graphs, 1938.

In this further account of his studies of the cereal root rot problem in New South Wales [*R.A.M.*, xiv, p. 621; xvi, p. 735; xvii, p. 306] the author states that under glasshouse conditions pre-emergence blight of wheat seedlings due to *Helminthosporium sativum* was pronounced in soils held at high (60 to 65 per cent.) and low (30 per cent.) moisture contents, while in both series emergence was slower and more irregular in the inoculated than in the uninoculated soil. The infected seedlings were conspicuously stunted. These features were more apparent in the high- than in the low-moisture series.

In two series of inoculation experiments on wheat seedlings with *Helminthosporium* M [*Curvularia ramosa*], *H. sativum*, and *Fusarium* sp. (in series A), and *H. sativum*, *Ophiobolus graminis*, *Fusarium* sp., and *Penicillium* sp. (in series B) singly and in various combinations, pre-emergence blight was greater with all the organisms tested in soil at 60 than at 30 per cent. water-holding capacity, but the difference in the amount of blight at high and low soil moisture varied widely for individual organisms and combinations of them. In series A, at 30 per cent. water-holding capacity, pre-emergence blight was greatest when all three fungi were combined. At the higher soil moisture content injury was greatest when the fungi were paired in various combinations or all associated together. In both the wet and dry series, stunting was greater in soil inoculated with two or three organisms than with only one; it was greater in the high- than in the low-moisture series. In series B, the greatest reduction in emergence at both high and low moisture contents occurred when all four fungi were associated, while stunting was most marked in the low-moisture set containing the four organisms. Pre-emergence blight was rather greater in the high- than

in the low-moisture set, but the growth of the surviving seedlings was better under the moister conditions.

In outdoor pot tests, rather more pronounced pre-emergence blight in wheat occurred when *C. ramosa* and *H. sativum* or *H. sativum* and *F. culmorum* were combined than when each was used alone, the most severe injury of all resulting when all three organisms were associated.

The data (analysed statistically and correlated with air temperature readings) obtained in experiments conducted during three years on the influence of temperature on infection of wheat seedlings by *H. sativum* showed appreciable reduction of emergence each year in the inoculated plots of early, mid-season, and late maturing varieties planted at the correct time, though there was one exception, due to low temperature; in each year reduction was greatest when the wheat was sown early. From 1927 to 1932, *Helminthosporium* root rot of adult wheat at Bathurst was most marked when the Meyer ratio of precipitation to absolute saturation deficit was relatively low from August to October. From 1924 to 1933, the disease was usually most severe in different parts of New South Wales when the rainfall was high or low during the growing period (April to October).

Controlled greenhouse experiments in 1931 demonstrated that *H. sativum* root rot in adult wheat developed only in series in which the soil moisture content was maintained at 30 per cent. water-holding capacity during the first three months of growth and then changed to and kept at 65 per cent. until maturity. Further tests showed that when the soil moisture content during the pre-ear-peeping stage was high the parasitism of *H. sativum* was negligible, whether the moisture content in the post-ear-peeping stage was high or low [ibid., xvii, p. 306]. The pathogen may be carried by the seed internally or externally and treatment of the seed-grain with disinfectants is of doubtful value. The application of superphosphate under certain conditions minimizes pre-emergence blight, but fallowing and suitable crop rotations are the best methods of control. The relative prevalence of *Helminthosporium* or *Fusarium* on the basal parts of wheat is not significantly affected by the type of crop sequence, and the beneficial effect of rotation is due to increased ability of the host to withstand attack rather than suppression of virulence in the parasite. Biological antagonism is not so important a factor with *H. sativum* as with *O. graminis*. Frosts, sheep-grazing, or excessive moisture fluctuations frequently result in severe outbreaks of disease which are likely to be moderated if crops are sown on well-consolidated land and on land containing adequate organic matter.

Pratt (K.). **Respiration of Wheat infected with powdery mildew.**—*Science*, N.S., lxxxviii, 2272, pp. 62–63, 1 graph, 1938.

The results of the experiments briefly described in this note showed that the respiration rate of Marquis wheat seedlings infected with powdery mildew (*Erysiphe graminis tritici*) and kept at 20·5° C. rose rapidly and reached a maximum value 2·5 to 3 times that of the controls in about nine days; it was maintained at a high value for about a week, and then began to decline, finally falling considerably below that of the controls. This increase in the rate of respiration is not

attributable to respiration of the parasitic fungus [cf. *R.A.M.*, xiv, p. 174] since leaves dusted with sulphur showed little decrease in respiration.

HONECKER (L.). **Über die physiologische Spezialisierung des Gerstenmeltaues als Grundlage für die Immunitätszüchtung.** [On the physiologic specialization of Barley mildew as a basis for breeding for immunity.]—*Züchter*, x, 7, pp. 169–181, 5 figs., 1938.

A fully tabulated account is given of the writer's continued studies at the Bavarian Plant Breeding Institute on physiologic specialization in barley mildew (*Erysiphe graminis*) in relation to breeding for immunity from this disease [*R.A.M.*, xvi, p. 804]. Nine physiologic races of the fungus (A to J) were used in inoculation experiments on a standard assortment of eight varieties and a further selection, some of which present a certain interest as potential parents in view of their more or less favourable reactions to two rusts (*Puccinia glumarum* race 23 and *P. simplex* [*P. anomala*] race 15) [ibid., xvii, p. 231].

In order to obtain sufficient inoculum of races B to J, it was necessary to adopt the so-called 'trap' method, consisting in the cultivation, in the midst of large susceptible stands, of small plots of varieties immune from the predominant A but reacting in various ways to the other races. Thus, Weihenstephan CP 127,422 serves as a 'trap' variety for race B and Ragusa DR 34–40 for C and D. The races B and D are the only ones besides A to which the slightest practical importance attaches.

Of the eight varieties comprising the standard assortment, only Hohenfinow four-rowed summer barley proved highly susceptible to all nine races, while *Hordeum spontaneum nigrum* was immune from all except the supposed mutant F. CP 127,422 was immune from races A, H, J, and D but highly susceptible to B, G, C, E, and F. Gopal C.I. 1091 showed marked resistance to all the races, while the remaining standard varieties reacted in different ways. Of the other varieties tested, Goldfoil, Hanna, Pflug's Intensiv, CP 127,422 and four more selections of the Plant Breeding Institute, all completely or virtually immune from *P. glumarum* and *P. anomala* and highly resistant to, or immune from, *E. graminis*, may be recommended as parents primarily for brewing barleys, while three Ragusa selections (DR 350, 6–9, and 14) are of interest in the work of winter barley selection. The descendants of such highly resistant varieties as *H. s. nigrum*, Gopal C.I. 1093, Nigrate C.I. 2444, Arlington C.I. 702, Zulu C.I. 1022, and Austral 22 would doubtless be totally or practically immune from all the known races of mildew, but their use as progenitors is limited by certain morphological and physiological departures from the prevailing standards necessitating protracted back-crossing to produce acceptable results. Varieties combining a fair degree of resistance both to mildew and the two rusts (of which *P. anomala*, with its many biotypes, constitutes a much more complex problem than *P. glumarum*, so far represented in the field exclusively by race 23) include Bolivia C.I. 1257, Weiden C.I. 1021, Zulu C.I. 1022, and Austral 22; these may prove useful as parents in the development of summer barleys.

The inheritance of the various factors conferring immunity or resistance may be mono-, di-, or polymerous according to the barley

variety and physiologic race of mildew involved, so that resistance appears either as a dominant, recessive, or intermediate character. As a rule, immunity is transmitted monomerously and the varying shades of resistance polymerously, the latter process giving rise to complex segregation ratios. For practical purposes, however, the geneticist's work is simplified by the fact that the resistance of certain barley varieties to several races of *E. graminis* is conditioned by the selfsame factor (group resistance), so that tests on hybrid progenies with one race will indicate the reaction of such populations to the entire group of races concerned.

Sampson (K[athleen]) & Western (J. H.). **Biology of Oat smuts. V. A ten years' survey of six spore collections. Propagation, screening and monospore isolation experiments.**—*Ann. appl. Biol.*, xxv, 3, pp. 490–505, 1 pl., 1938.

Details are given of the authors' studies over a period of ten years on the behaviour and relative stability on the differential hosts of three physiologic races each of *Ustilago avenae* and *U. kolleri* [*R.A.M.*, xv, p. 711]. The authors explain that there are three methods of treating smut collections to bring them nearer to purity of type. The first is the use of differential host varieties in screening experiments. From a mixture of two types it should be possible, if hybridization does not take place, to screen out one type completely by inoculating the grain of two differential hosts; if the smuts hybridize, the effect of screening will depend on the behaviour of the heterozygous dikaryophyte. The second method is to isolate a single chlamydospore, grow it in culture, and inoculate seedlings; the purity of the smut population will then depend on the genetic constitution of the chlamydospore. The third method (not used in these tests) is to start the cultures from paired sporidia from one chlamydospore.

The results showed that, for the L_2 race of *U. avenae*, screening soon resulted in the loss of its capacity to attack *Avena strigosa*. By monospore isolations the C_2 race of *U. kolleri* was resolved into two types, one of which remained unchanged, while the other had a narrower range of infection than the parent collection, and failed to infect *A. strigosa*. Monospore isolations of the C_4 race of *U. kolleri* also yielded two types, one of which was more and the other less pathogenic than the collection as a whole. It is believed that these changes may most probably be explained by the assumption that the heterozygous condition persisted through a number of chlamydospore generations produced in the host plant, and this probably limits the efficiency of screening experiments as a means of obtaining races genetically pure for pathogenicity characters. No changes were observed in the other three races (L_{11} and L_{12} of *U. avenae* and C_1 of *U. kolleri*). A study of the cultural characters of monospore lines showed the absence of any distinction between *U. avenae* and *U. kolleri*, the absence of any correlation between pathogenicity and growth in culture, and the extraordinary uniformity of monospore cultures within the collection L_{11} of *U. avenae*. In further experiments monosporidial lines of L_{11} in culture also showed, in contrast to L_2, almost perfect uniformity, indicating absence of segregation in definable characters. No success was

encountered in a special series of experiments designed to break down the resistance to smut in certain selected oat varieties.

MUSKETT (A. E.). **A Study of the epidemiology and control of Helminthosporium disease of Oats.**—*Ann. Bot., Lond.*, N.S., i, 4, pp. 763–784, 2 pl., 4 diags., 2 graphs, 1937.

The author undertook this study of the epidemiology of *Helminthosporium avenae* on oats with a view to evolving a standard technique for the evaluation of seed disinfectants [*R.A.M.*, xvii, p. 261, and next abstract] which would be more accurate and speedy than field trials. In pot experiments in 1934–5 oat seedlings were raised from infected seed of the Potato variety under varying controlled conditions of soil type, soil moisture, and soil temperature. The experiments were concluded when the second leaf was as long as the first, this being the stage of the maximum incidence of the primary phase of the disease. Soil temperature was found to be the chief factor governing the incidence of the disease. Within a range of temperatures likely to occur in a normal spring (6·6° to 13° C.) the incidence and the intensity of the disease decreased progressively under wet and moist soil conditions with a rise in the mean temperature. The disease was more severe in dry soil and did not decrease with the rise of temperature, soil moisture acting as a limiting factor. In an experiment with a sample containing 60 per cent. infected seeds, 56 per cent. of the seedlings were diseased on cold, dry soil and only 15 per cent. on wet and warm soil. The incidence of the disease generally decreased with improved conditions for rapid growth of the plants. The type of soil had little influence on the incidence of the disease apart from the effects derived from its warmth- and moisture-retaining properties. The pre-emergence phase of the disease was most marked under cold, wet conditions of growth, and also showed a tendency to occur under high temperatures on dry soil. The results obtained were the same for both heavily and lightly infected seeds. Seed disinfection before sowing with an organic mercury dust of proved value gave almost perfect control of the disease under all conditions except in the case of dry soil and high temperature. The results of this study indicate that the best conditions for testing the value of seed disinfectants occur in plants grown at a mean soil temperature of 8° to 10° (coinciding with a very high incidence of the post-emergence phase of the disease) and soil moisture of 50 per cent. saturation. It appears desirable, furthermore, to repeat the test under conditions of dry soil (25 per cent. saturation) and high temperature (12° to 13° C.).

MUSKETT (A. E.). **Biological technique for the evaluation of fungicides. I. The evaluation of seed disinfectants for the control of Helminthosporium disease of Oats.**—*Ann. Bot., Lond.*, N.S., ii, 7, pp. 699–715, 1 pl., 1938.

Three biological methods for determining the value of seed disinfectants for the control of *Helminthosporium avenae* on oats were tested in Northern Ireland over a period of three years [see preceding abstract]. The laboratory method is described as follows. Seeds (100) treated with the disinfectant under investigation are arranged with equidistant

spacing in Petri dishes lined with moistened filter paper and the dishes placed in an open container and covered with moist cloths. After incubating at about 22° C. for three days the seeds are irradiated on the fourth day for 20 minutes, using a Hanovia quartz mercury vapour lamp 1 ft. from the dishes, and replaced in the incubator until the ninth day, when they are examined for the presence of conidia of *H. avenae*.

In the pot culture method oat seedlings from seed samples under investigation are raised in two parallel tests (soil at 50 per cent. saturation and a temperature of 8° to 10° for the first test and soil at 25 per cent. saturation and a temperature of 12° to 14° for the second) to the stage where first and second leaves are of equal length, when the seedlings are cut off and examined, and the disease assessed by the presence of 'stripe' lesions. The first test lasts for about 40 to 50 days; the second 30 to 40 days.

The field method consists in sowing the disinfected grain under field conditions in five replications in plots covered with wire netting and examining the seedlings when the symptoms of the disease have become fully apparent. The test lasts from 31 to 42 days. The sample of seed oats to be tested should contain at least 15 per cent. of grains infected with *H. avenae*. Those materials which satisfy the conditions of the laboratory test should be subjected to the two pot trials and the field test. A high degree of correlation has been found to exist between the results obtained by the three methods. It is tentatively suggested that a satisfactory fungicide should not allow more than about 0·2 per cent. disease to be found in the pot and field trials.

Of the fungicides tested, the proprietary materials containing organic mercury compounds gave the best results, formalin did not control *H. avenae*, and fillers such as talc and silica had little fungicidal value, although one sample of silica appeared to exercise some measure of control. Cuprous oxide failed to control the disease and caused a noticeable depression of growth.

Wellhausen (E. J.). **Infection of Maize with Phytomonas flaccumfaciens, P. insidiosa, P. michiganensis, P. campestris, P. panici, and P. striafaciens.**—*Phytopathology*, xxviii, 7, pp. 475–482, 2 figs., 1938.

In inoculation experiments under controlled conditions in the greenhouse with ample moisture and at a temperature range of 80° to 90° F., very young and rapidly growing seedlings of two inbred lines of maize, GB (Golden Bantam) 797 and OSF, were severely injured or killed by pure cultures of *Phytomonas* [*Bacterium*] *flaccumfaciens* [*R.A.M.*, xvii, p. 660], *P. insidiosa* [*Aplanobacter insidiosum*: ibid., xvii, p. 301], and *P. michiganensis* [*A. michiganense*: ibid., xvii, p. 660], while *P.* [*Pseudomonas*] *campestris*, *Phytomonas* [*Bact.*] *panici* [ibid., v, p. 130], and *P.* [*Bact.*] *striafaciens* [ibid., xv, p. 280] induced milder effects. With the exception of *A. insidiosum*, all the organisms attacked line GB 797, susceptible to wilt (*P.* [*A.*] *stewarti*), more readily than the resistant OSF.

The types of symptoms induced by the various organisms were generally similar and included more or less extensive obstruction of the xylem vessels of certain vascular bundles in the leaves, stems, and mesocotyls, and discoloration, frequently accompanied by transparency, of the leaf veins and adjoining tissues.

A. stewarti caused slight dwarfing of Golden Cluster beans [*Phaseolus vulgaris*] and discoloration of the nodal and internodal stem tissues, while Proso millet (*Panicum miliaceum*) and Early Pearl oats inoculated with the same organism developed a brown, water-soaked, irregular striation of the veins resembling that due to wilt on maize. Negative results were obtained in tests with *A. stewarti* on tomatoes and cabbage. The results indicate that the organisms similar to *A. stewarti* in cultural characters (viz., *Bact. flaccumfaciens*, *A. insidiosum*, *A. michiganense*) are capable of considerable growth in the medium of the maize plant under conditions most favourable to *A. stewarti*.

Smith (A. L.), Hoppe (P. E.), & Holbert (J. R.). **Development of a differential inoculation technique for Diplodia stalk rot of Corn.**—*Phytopathology*, xxviii, 7, pp. 497–504, 3 figs., 1 graph, 1938.

The writers have evolved a rapid and convenient inoculation technique for the determination of the relative resistance of inbred lines of maize to stalk rot (*Diplodia zeae*) [*R.A.M.*, xvii, p. 670] in Illinois. In 1931 needle puncture inoculations with pycnospore suspensions of a pure culture of the fungus were made through the lower internodes of 13 single crosses representing various combinations among nine different inbred lines, and measurements of the spread of infection in the pith and cortex were taken during the second week in October. Additional replications of uninoculated plants were kept under observation for their reaction to natural infection by the fungus and the extent of stalk-breaking caused by the disease. The following correlation coefficients were obtained: pith and cortical spread, +0·948; natural infection and broken stalks, +0·909; pith spread and natural infection, +0·853; pith spread and broken stalks, +0·821; cortical spread and natural infection, +0·878; and cortical spread and broken stalks, +0·899.

Evidence was secured in these tests of the positive influence of inbreds on hybrid reaction. Thus, the four different hybrids having the inbred resistant *Hy* as one of the parents ranked highest in resistance to cortical spread, whereas two that combined two susceptible inbreds showed the lowest resistance. Resistance was manifested by one hybrid involving a highly resistant and a very susceptible inbred ($H \times Hy$), indicating a dominance of resistance in this cross.

Bitancourt (A. A.). **A mancha d'agua e a podridão d'agua da Laranja.** [The water spot and water rot of the Orange.]—*Biologico*, iv, 8, pp. 273–274, 1 fig., 1938.

The author records the occurrence in Brazil of a fruit spot, externally identical with the California water spot [*R.A.M.*, xvii, p. 671], on Bahia oranges sent in for examination in 1936 and 1938. The disease probably originated in the groves, although it was first noticed in the stored fruits.

Morris (A. A.). **The effect of differential fertilizer treatments on the yield and quality of fruit from mature bearing Valencia late trees on Mazoe Citrus Estate, Southern Rhodesia.**—*Rep. Brit. S. Afr. Co., Mazoe Citrus exp. Sta., 1936*, pp. 107–154, 3 pl., 2 graphs, 1937. [Received October, 1938.]

Further study in Southern Rhodesia on 'hard fruit' of orange due to

boron deficiency [*R.A.M.*, xvii, p. 744] indicated that the most susceptible variety locally is Valencia Late budded to the Mazoe rough lemon, while the least susceptible appears to be Washington Navel on the same stock.

The first symptom of boron deficiency in the field is a tendency of apparently healthy trees to wilt more frequently than is warranted by the amount of water supplied, this characteristic finally becoming so marked that no amount of water, however frequently applied, prevents wilting even in trees carrying negligible crops. Before this stage is reached, abnormal shedding of the crop occurs. The fruits that remain on the tree show gumming and arrested development. The rind thickens, and the seeds are shrivelled or absent. In the earliest stages the young fruits readily fall, and offer slight resistance to cutting. The fruits are misshapen or mummified, and gradually turn yellowish-green. Gumming may occur anywhere within the fruit, though greatest in the centre towards the end of the season, most of the fruits affected in the rind tissues falling earlier.

New tree growth is limited, and usually short-stemmed. Die-back becomes increasingly marked with the development of multiple bud and short, upright growth. The leaves sometimes become thickened, and in an advanced stage may show characteristic pitting on the under surface, this pitting occurring more usually, but not exclusively, on the leaves most remote from the source of nutrient supply. The final appearance of the affected trees bears a striking resemblance to the published descriptions of exanthema [ibid., xvii, p. 16].

The effect on affected trees of boron applications is one of marked stimulation. All new growth is entirely devoid of pitting. Young fruits are held firmly to the tree and remain turgid. Ripening fruits are very thin-skinned. There is every evidence that the average juice percentage in the local crops will increase considerably as a result of boron treatment.

Marchionatto (J. B.). **Argentine Republic: transmission of the 'lepra explosiva' of the Orange by mites.**—*Int. Bull. Pl. Prot.*, xii, 6, pp. 121–122, 1938.

Positive results are stated to have been obtained in experiments by M. J. Frezzi at the Phytopathological Laboratory, Corrientes Province, Argentine Republic, in the transmission of 'lepra explosiva' [leprosis] from diseased to healthy sweet oranges [*R.A.M.*, xv, p. 14] by means of mites (*Tenuipalpus* sp. near *T. californicus*) (200 to each plant). The symptoms began to develop after 2½ months on the foliage, twigs, petioles, and spines, and as many as 40 lesions were observed on one plant after three months. Severely infected leaves turned yellow and fell.

Reid (W. D.). **Citrus-blast in New Zealand.**—*N.Z.J. Sci. Tech.*, A, xx, 1, pp. 50–54, 4 figs., 1938.

Citrus blast (*Pseudomonas syringae*) [*R.A.M.*, xvii, p. 660], first recognized in New Zealand in 1927, is stated to be now present in the main citrus-growing areas of the Colony. A technical description of the causal organism is given, supplemented by brief notes on the sympto-

matology and control of the disease. Under New Zealand conditions infection is most active during the late winter and early spring, and is frequently serious on nursery stocks, some or all of the laterals of which may be blackened and killed, while the succulent shoots of older trees may be destroyed and the fruits severely pitted. Lemon foliage and fruit are more commonly affected than those of orange. Contributory factors in the development of blast in New Zealand, as elsewhere, include cold, damp conditions and the presence on the immature growth of the host of injuries due to strong winds, driving rain, hail, frost, thorn scratches, or insect infestation.

Reid (W. D.). **Citrus-canker in New Zealand.**—*N.Z.J. Sci. Tech.*, A, xx, 1, pp. 55–62, 5 figs., 1938.

Lemon leaves from Kerikeri, Bay of Islands, submitted for inspection in May, 1937, were found to be infected by citrus canker, the causal organism of which was isolated in pure culture on beef-peptone agar and found to agree with *Pseudomonas citri* [*R.A.M.*, xii, p. 376; xvi, p. 329], a technical description being given. This is the first record of the pathogen in New Zealand. A survey of the North Island revealed the presence of the disease on 698 trees in 33 orchards; in the single affected nursery 28,000 stocks (not all attacked) were destroyed. It has not been possible to trace the source of introduction of the bacterium which apparently entered the country about three seasons ago, possibly less, judging by the condition of the infected tissues. The damage sustained by the affected trees was relatively slight, involving only slight defoliation besides disfigurement of the fruit. At Kerikeri infection occurred roughly in the following descending order of susceptibility: Ponderosa, Eureka, Lisbon, and Meyer lemons, Marsh's Seedless grapefruit, Washington Navel, Valencia, and other sweet oranges; and New Zealand grapefruit or Poorman orange (pomelo × sour orange). Drastic control measures, including 'bare-pole' pruning, stringent sanitary precautions, spraying with lime-sulphur (0·2 per cent. polysulphides), and the application to wounds of bitumen paint or petrolatum have been initiated.

Mayne (W. W.). **Annual Report of the Coffee Scientific Officer, 1937–1938.**—*Bull. Mysore Coffee Exp. Sta.* 17, 17 pp., 1938.

Tests carried out in Mysore with two copper oxide sprays ('materials A and B') against coffee leaf disease (*Hemileia vastatrix*) [*R.A.M.*, xvii, pp. 31, 315] showed that both, especially B, gave promising results. Observations on the time of spraying in hot weather in relation to the blossom showers supported those made in the previous year; in 1936, the plot sprayed earliest gave the best results [ibid., xvii, p. 31], while in 1937 the second plot gave the best figures, with 63 per cent. leaf survival, and 37·4 per cent. infection of the surviving leaves. In both years, the most striking feature was the marked falling-off in the results given by the later applications.

Black bean [loc. cit.] and similar defects caused serious loss, and the evidence obtained again indicated that the cause of these troubles must be sought for much earlier in the crop season than harvest time.

The following defects appear to be fundamentally related, all showing microscopic abnormalities in the silver skin: (1) black 'jelloo', (2) spotted bean, (3) black bean, (4) 'burnt' bean, (5) green bean, and (6) (?) dry and coated bean. All the evidence suggests that these defects are due to some disturbance of the moisture or nutrient supply of the bean comparatively late in its development. 'Burnt' and 'green' beans showed losses of weight on drying which varied between 53 and 60 per cent., as against 49 per cent. for normal beans.

Brown (H. B.). **Cotton: history, species, varieties, morphology, breeding, culture, diseases, marketing, and uses. Second edition.**—xiii+592 pp., 109 figs., 7 diags., 19 graphs, 5 maps, London, McGraw-Hill Publishing Company, Ltd., 1938. 30*s*.

In the revised edition of this valuable treatise on the cotton plant, first published in 1927 and now amplified and brought up to date, the author includes a concise discussion of the chief diseases of the crop in a chapter of 32 pages.

Oknina (Mme E. Z.). Вертициллоз Хлопчатника. [The *Verticillium* disease of Cotton.]—*Тр. Инст. Физиол. Раст. им. К. А. Тимирязева.* [*Trans. Timiryazeff Inst. Pl. Physiol.*], ii, 1, pp. 83–115, 7 figs., 1937. [Received September, 1938.]

Although *Verticillium albo-atrum* [*R.A.M.*, xvi, p. 808] has not been recorded during recent years as an agent of cotton wilt in the U.S.S.R. [but see ibid., xi, p. 41], the author found both this species and *V. dahliae* [ibid., xvii, p. 392] in the diseased tissue of cotton plants in Fergana [Uzbekistan, Asiatic Russia]. The two fungi proved to be clearly distinct in most of their morphological and physiological characters [ibid., x, p. 758]. In quantitative experiments on the growth of the two species on various media, the quantity of medium capable of yielding 100 mg. dry weight of *V. albo-atrum* is taken to be the unit and the corresponding weights of *V. dahliae* produced on units of various media tested were found to be 31·4 mg. on glucose, 48·7 mg. on maltose, 112·6 mg. on starch, 133·5 mg. on sodium nitrate, 148·8 mg. on ammonium nitrate, 133·7 mg. on casein, 22·9 mg. on peptone, and 22·4 mg. on gelatine. Assuming that the fermentative activity of *V. albo-atrum* is 100 for each of a number of endo- and ectoenzymes, the corresponding values for *V. dahliae* were 50 and 30·9 for catalase, 109·4 and 16·4 for amylase, 59·6 and 45·0 for saccharase, and 102·9 and 94·5 for maltase. The rate of transpiration of healthy leaves was found to be generally about 50 per cent. higher than that of the diseased plants (affected by either species) both in the flowering and vegetative phases. The proportion of open stomata was also higher in the healthy plants, and the water content was about twice as high as in the diseased leaves. On the whole *V. albo-atrum* is considered to be the more virulent parasite of the two. No toxic substances capable of causing wilt could be detected either in pure cultures of the fungi or in the diseased tissues, and the biochemical causes of wilt are believed to be inherent in the fermentative action of the parasites.

Sukhorukoff (K. T.). Изучение признаков устойчивости сортов хлопчатника к вилту и гоммозу. [A study of the characters indicating resistance of Cotton varieties to wilt and gummosis.]—*Тр. Инст. Физиол. Раст. им. К. А. Тимирязева.*—[*Trans. Timiryazeff Inst. Pl. Physiol.*], ii, 1, pp. 117–137, 1937. [Received September, 1938.]

This study on wilt and gummosis of cotton, economically the two most important diseases of the crop in Ferghana [Uzbekistan, Asiatic Russia], was carried out by a team of workers sent from the Institute of Plant Physiology of the U.S.S.R. Academy of Science in 1936. Isolations from wilt-diseased tissues yielded an undetermined species of *Verticillum* with strongly pigmented and rapidly growing mycelium, distinct from *V. dahliae*, which was also found, but more rarely [cf. preceding abstract]. In a series of experiments on the physiology of wilt-diseased plants it was found that the accumulation of dry substance in diseased plants is considerably diminished, the transpiration lowered, and the number of open stomata reduced. An anatomical study of various cotton varieties showed that immune varieties have a firm pith of small cells and medullary rays of many layers always filled with reserve starch, whereas susceptible varieties have a loose-textured pith and inconspicuous medullary rays of one or rarely two to three layers with little starch. Selection based on these anatomical distinctions is recommended for breeding work.

Gummosis [blackarm] of cotton caused by *Bacterium malvacearum* [*R.A.M.*, xvii, pp. 391, 439] is generally less important than wilt in the dry climate of Ferghana, except in the nurseries and in damp districts. It was thought that the bacteria multiply in the water collected on the surface of the leaves, thriving on the organic matter diffused into the water. To check this hypothesis fresh and uninjured leaves were immersed in distilled water at 30° C. After 20 minutes some of the water was poured into a flask and the amount of organic matter present was determined by means of potassium permanganate. The results of several replications and variations of this experiment showed that the susceptible varieties diffused more organic matter into the water than the resistant. The diffusion from young leaves of susceptible varieties was higher than from old and increased with the increase of temperature, while both factors were without effect in resistant varieties. Rapidity of ageing of the leaf tissues and consequent reduction in diffusion of organic matter may possibly be a factor in determining resistance.

Feytaud (J.). **Recherches sur le Doryphore : III. Causes de reductions naturelles (milieu, maladies, ennemis).** [Researches on the Colorado Beetle: III. Causes of natural reduction (environment, diseases, pests).]—*Ann. Epiphyt.*, N.S., iii, 1, pp. 35–97, 2 pl., 4 figs., 1937. [Received October, 1938.]

Studies on the possibilities of biological control of the Colorado beetle (*Leptinotarsa decemlineata*) in France by means of its fungal pathogens led to the following conclusions. In the mellow soils of the Bordeaux district the insect is decimated by *Beauveria effusa* [*R.A.M.*,

xvi, p. 531], but immune from infestation by *B. densa*, and highly resistant to *B. globulifera* [loc. cit.] and *B. bassiana* [ibid., xvii, p. 745]. In the vicinity of Rennes, the place of *B. effusa* is taken by another closely related virulent pathogen of *L. decemlineata*, *B. doryphorae* [ibid., xvi, p. 531]. In the United States the Colorado beetle is subject to a disease caused by *Bacillus leptinotarsae*, and there is reason to believe that a bacterium is also pathogenic to the insect in France, but so far circumstances have prevented intensive studies in this direction.

Ciferri (R.) & Redaelli (P.). **A new hypothesis on the nature of Blastocystis.**—*Mycopathologia*, i, 1, pp. 3–6, 1938.

The work described in this paper has already been noticed from another source [*R.A.M.*, xv, p. 94].

Lodder (J.) & de Vries (N. F.). **Some notes on Torulopsis glabrata (Anderson) nov. comb.**—*Mycopathologia*, i, 2, pp. 98–103, 2 figs., 1938.

The authors describe the results of a morphological and cultural study of five strains of *Cryptococcus glabratus* [*R.A.M.*, xv, p. 153; xvii, p. 177] received at the Centraalbureau voor Schimmelcultures, namely: (*a*) a strain received in 1936 from the American Type Culture Collection, and believed to be almost certainly the authentic strain isolated by Anderson; (*b*) a strain sent by Ota in 1924 from Brussels; (*c*) a strain received in 1934 from the Dermatological Department of the University of Amsterdam, and isolated from a recidivating human ulcer; (*d*) a strain isolated in Holland from the urine of a patient suffering from cystitis; and (*e*) a strain repeatedly isolated in 1937 from the sputum of a Dutch patient presenting symptoms of tuberculosis. The results showed that the organism which, in accordance with the nomenclature adopted by the authors [ibid., xvii, p. 675], is renamed *Torulopsis glabrata* n.comb., did not produce pseudomycelium or ascospores. In malt extract it forms ovoid cells, 4 to 5 by 2·5 to 3·5 μ in diameter, arranged in pairs or in short chains, and on malt agar, besides cells of this type, very small cells, 2·5 to 3 by 1·5 to 2 μ, produced singly or in pairs. Of the sugars tested, only glucose, fructose, and mannose are fermented; and ammonium sulphate, urea, asparagin, and peptone are assimilated but not nitrate. In a medium with ethyl alcohol as the only source of carbon, no growth occurred.

The results of inoculation experiments carried out on rats were inconclusive, but the authors' observations as a whole leave no doubt that *T. glabrata* is a saprophyte of frequent occurrence in man, which under certain conditions may invade the host and give rise to more or less serious local disturbances in various organs.

Ciferri (R.), Redaelli (P.), & Visocchi (V.). **The Histoplasmaceae family. Synthetic review.**—*Mycopathologia*, i, 2, pp. 104–114, 1938.

The authors discuss at some length their transference of *Posadasia capsulata*, *Cryptococcus farcinimosus*, and *C. muris* to the genus *Histoplasma*, under the names *H. capsulatum*, *H. farcinimosum*, and *H. muris* [*R.A.M.*, xiii, p. 769; xiv, pp. 235, 446, 583], and give full data

from their studies and from the literature in support of this transference. An English technical description of the genus is given.

Ciferri (R.), Redaelli (P.), & Cavallero (C.). **L'Oidium albicans Robin (Mycotorula albicans (Robin) Lang. et Tal. 1932; studio critico e sperimentale.)** [*Oidium albicans* Robin (*Mycotorula albicans* (Robin) Lang. & Tal. 1932; a critical and experimental study).]—*Mycopathologia*, i, 2, pp. 115–161, 2 pl., 1938. [Summaries in English, German, and Spanish.]

From a careful review of the relevant literature and their studies of a number of isolations received from various parts of the world, the authors find that the organism most frequently isolated from human thrush and capable of causing a great diversity of superficial and deep-seated infections in man and animals is a fungus referred by other workers to *O. albicans* and to several other binomials. It presents the morphological characters of the genus *Mycotorula*, and that it ferments glucose, levulose, and maltose regularly; other carbohydrates irregularly and only to a small extent, and saccharose never. For these and other reasons, which are discussed at some length, they accept Langeron and Talice's combination *M. albicans* [*R.A.M.*, xi, pp. 457, 476], and give a list of 45 binomials which they consider to be certainly synonymous, including *Candida albicans*, *C. bronchialis*, *C. pinoyi*, *Cryptococcus harteri*, *Monilia parakrusei*, *M. psilosis*, *M. metalondinensis*, *M. londinensis*, *M. richmondi*, and *Myceloblastanon favrei*. A list is also given of nine doubtful synonyms, including *Monilia inexorabilis* [ibid., xv, p. 581]. An Italian technical description of the yeast is appended.

Lewis (G. M.) & Hopper (Mary E.). **Infections of the skin due to Monilia albicans. II. Immunologic, etiologic, and therapeutic considerations.**—*N.Y. St. J. Med.*, xxxviii, 11, pp. 859–866, 2 figs., 2 graphs, 1938.

In the course of studies on various forms of dermatomycosis associated with the presence of *Monilia* [*Candida*] *albicans* [*R.A.M.*, xvii, p. 746 and preceding abstract] on the skin or tongue or in the intestinal tract, the writers detected the fungus in one or more of these sites in 52 New York hospital patients from 10 to 69 years old. Some evidence was obtained of its connexion with excess weight, diabetes [see next abstract], and previous debilitating illness, while a specially high degree of susceptibility was observed among persons whose occupations necessitated frequent soaking of the hands.

Kelly (H. T.). **The significance of dermatophytosis in diabetes.**—*Penn. med. J.*, xli, 7, pp. 581–589, 5 figs., 1938.

The very important part played by species of *Epidermophyton* in the preparation of the cutaneous tissues for secondary infection by gangrene in diabetic patients is reviewed and preventive and therapeutic measures discussed. Excellent diagnostic and curative results have been obtained with Fonseca's 'dermotricofitin' vaccine, consisting of a filtrate of 300 strains of *Trichophyton*, *Microsporon*, *Achorion*, *Endodermophyton*, and *Epidermophyton*.

Niizawa (S.). **Ueber die Dermatomykosen in unserer Klinik, in Laioyang, Tienring und in einigen japanischen Militärregimentern.** [On the dermatomycoses observed in our clinic, in Liaoyang, Tienring, and in certain Japanese military regiments.]—*J. orient. Med.*, xxviii, 6, pp. 1275–1308, 2 pl., 4 figs., 9 graphs, 1938. [Japanese, with German summary on pp. 100–101.]

During the period from April, 1934 to May, 1935, the writer isolated from 235 cases of dermatomycosis in his clinic at Mukden, Manchukuo, in Liaoyang, Tienring, and in certain Japanese regiments, 165 fungal strains belonging to the species *Trichophyton violaceum*, *T. glabrum*, *T. purpureum* [*R.A.M.*, xvii, p. 679], *T. interdigitale*, *T. gypseum radiolatum* [? *T. mentagrophytes*], *T. pedis* [ibid., xvi, p. 459], *Epidermophyton inguinale* [*E. floccosum*: ibid., xvii, p. 747], *Endodermophyton* [*T.*] *concentricum* [ibid., xvii, p. 245], *Microsporon japonicum* [ibid., xvi, p. 748], and *Grubyella* [*Achorion*] *schönleini* var. *mongolica* [loc. cit.]. Of these, *T. interdigitale* and *T. purpureum* were found to be the chief agents of trichophytia pompholiciformis (54 cases) and trichophytia interdigitalis (65), respectively, four patients suffering from these disorders harbouring both species simultaneously.

Milochevitch (S.). **Trichophyton immergens et ses manifestations cliniques.** [*Trichophyton immergens* and its clinical manifestations.] —*Mycopathologia*, i, 2, pp. 88–97, 3 pl., 1938.

Trichophyton immergens [*R.A.M.*, xvi, p. 457] was isolated from eleven cases of circinate herpes in Jugoslavia, and also from ringworm on an ox. The fungus is apparently present in nearly the whole of the country, with the exception of the most westerly provinces, and it is believed that human beings very probably contract infection from cattle, although it may also be transmitted from man to man. In pure culture *T. immergens* was shown to differ from other megaspore-producing *T.* species [which are listed in a comparative table] by its colonies on glucose media being almost completely immersed, while on maltose substrata they exhibit a ring of white down and a halo of short rays of equal length around an irregular centre.

Grigoraki (L.). **Sur un nouveau milieu de conservation des dermatophytes.** [On a new medium for the preservation of dermatophytes.]—*C.R. Soc. Biol., Paris*, cxxviii, 22, pp. 887–888, 1938.

The following formula is stated to have given excellent results in the prevention of pleomorphism [cf. *R.A.M.*, xvi, p. 383] in *Trichophyton faviforme* (14 strains from the U.S.S.R.) [ibid., xvi, p. 535], *Achorion violaceum* [ibid., xvii, p. 395] (3 from Greece), and one each of *Microsporon lanosum* and *T. crateriforme* [ibid., xvii, p. 680]: 1·8 gm. agar, 1 gm. peptone, 2 gm. maltose, and 50 c.c. each of water and milk.

Grigoraki (L.) & David (R.). **Caractères biochimiques des champignons des teignes.** [The biochemical characters of the ringworm fungi.]—*C.R. Soc. Biol., Paris*, cxxviii, 22, pp. 889–891, 1938.

The writers briefly describe and tabulate the results of their comparative biochemical studies on *Trichophyton crateriforme* and *Achorion*

violaceum [see preceding abstract], agents of human ringworm in Greece, cultured on Sabouraud's medium. The dissolution of the casein content of 10 c.c. of milk was accomplished in 19 days by *T. crateriforme* and in 40 by *A. violaceum*, the corresponding periods for the liquefaction of gelatine being 6 and 3 days, respectively. The reducing sugar in a 10 per cent. saccharose solution amounted to 2·05 gm. per l. in the case of *T. crateriforme* and to 2·60 in that of *A. violaceum*. *T. crateriforme* fermented glucose in an 8 per cent. solution, but *A. violaceum* was unable to do so. Both species grew best at 35° C., the maximum for *T. crateriforme* being 45° and for *A. violaceum* 43°

Gohar (N.). **The first survey of ringworm in Egypt.**—*J. trop. Med.* (*Hyg.*), xli, 14, pp. 229–234, 3 graphs, 1938.

An analysis of 300 cases of ringworm infection in Egypt is presented, based on the microscopic examination of isolations of the fungi concerned on Sabouraud's glucose agar. Favus associated with *Achorion schoenleini* [*R.A.M.*, xvii, p. 530] was the predominant disorder, occurring in 58·67 per cent. of the total number of cases investigated, followed by *Trichophyton violaceum* [ibid., xvii, p. 679] (39·67), *Microsporon canis* [ibid., xiv, p. 581; xvii, p. 174] (1·33), and *T. tonsurans* [ibid., xiv, p. 169] (0·5). *A. schoenleini* was most prevalent in the country (83 per cent. of all cases) and *T. violaceum* in the town (52·6). Boys are more liable to infection than girls, especially by *A. schoenleini* (60·3 and 56·2 per cent., respectively). Favus infections tend to assume a chronic character, while those due to *T. violaceum* run comparatively shorter courses. The clinical features and microscopical data of the four types of infection are described.

Gomes (J. M.). **Chromoblastomycosis caused by a fungus of the genus Hormodendron.**—*Arch. Derm. Syph., Chicago*, xxxviii, 1, pp. 12–18, 4 figs., 1938.

A hitherto undescribed species of *Hormodendrum*, forming greyish-green colonies on Sabouraud's medium, was isolated at São Paulo, Brazil, from an injury on the hand of a workman inflicted by the fall of a small *Eucalyptus* branch. The fungus formed concatenate, unicellular, oval, or rounded, acrogenous spores and round pigmented bodies (6 μ in diameter in culture, 3 to 4 μ in the tissues). Positive results were obtained in inoculation experiments on laboratory animals. The fungus is not named.

Catanei (A.). **Sur la place de Trichophyton rubrum dans la classification. Étude parasitologique et expérimentale d'une nouvelle souche de ce champignon.** [On the systematic position of *Trichophyton rubrum*. A parasitological and experimental study of a new strain of this fungus.]—*Arch. Inst. Pasteur Algér.*, xvi, 2, pp. 227–231, 1 pl., 1938.

On Sabouraud's glucose agar a strain of *Trichophyton rubrum* isolated from the inguinal region of a 17-year-old native of Tongking [Indo-China: *R.A.M.*, xvii, p. 679] formed velvety, plicate, darkish-red colonies with a downy, white centre and smooth, yellowish-white

periphery. The reddish pigmentation did not develop on malt or non-sugar-containing agars and was generally missing also from rice flour agar; the last-named medium proved particularly valuable for the study of the spores of the fungus [cf. ibid., xvi, p. 457]. Inoculation experiments on guinea-pigs and monkeys with pure cultures of this strain of *T. rubrum* induced the development of the megaspore ectothrix type of hair infection. Langeron and Milochevitch [ibid., x, p. 242] place *T. rubrum* among the species not attacking the hair, and its transference to the second (megaspore) section of their classification is suggested.

Ciferri (R.) & Verona (O.). **A species of Sporobolomyces (Nectaromycetaceae) isolated from man and a revision of the genus.**—*Mycopathologia*, i, 2, pp. 162–164, 1938.

Among the new species described in this revision of the genus *Sporobolomyces*, mention may be made of *S. pollaccii* n.sp., which was isolated from a human dermatomycosis at Siena, Italy; its pathogenicity has not yet been determined. [An expanded account of this work is published in *Atti Ist. bot. Univ. Pavia*, x, Ser. IV, pp. 240–255, 1938.]

Lack (A. R.). **Spherule formation and endosporulation of the fungus Coccidioides in vitro.**—*Proc. Soc. exp. Biol., N.Y.*, xxxviii, 5, pp. 907–909, 1938.

Details are given of a series of semi-anaerobic experiments undertaken at Stanford University School of Medicine, San Francisco, with a view to determining the prerequisite conditions for spherule formation in *Coccidioides immitis* [*R.A.M.*, xvi, p. 461; xvii, p. 528].

Constricted tubes of the Hall type (*J. infect. Dis.*, xxix, p. 317, 1921) were filled above the point of constriction with glucose broth (P_H 7·2) and heated to 100° C. for 15 minutes. After cooling to room temperature they were inoculated with a suspension of chlamydospores in a preparation of fresh egg albumin from an eight-week-old culture; this was pipetted into the bottoms of the tubes, the constricted necks of which were closed off by sterile marbles. Partial coagulation of the albumin was obtained by gentle warming. Four control tubes were prepared: one identical with the foregoing but uncoagulated, one containing the inoculum but no marble, one with albumin alone, and one with the chlamydospore suspension and no albumin.

After 24 hours the chlamydospores within the albumin showed slight enlargement, and at the end of 48 hours incipient spherule formation was detected. Some of these bodies measured 20 to 30 μ in diameter and were characterized by a finely granular content and greenish, granular capsules (granular type), while others, 30 to 40 μ in diameter, also of a granular consistency, possessed a thick, yellow-green capsule, from the periphery of which radiated numerous large spicules, broad at the base and narrowing to a very sharp point, as described by Rixford and Gilchrist (*Rep. Johns Hopkins Hosp.*, i, p. 209, 1896). After a week many greenish, granular spherules, some with typical spicules, were revealed by cover-slip examinations of the egg albumin in the experimental tubes, while a few clear spherules with wide, refractile, double-contoured, yellowish-green capsules were also present, together with one large spherule (50 μ in diameter)

containing endospores, 6 to 10 μ in diameter. The control tubes showed no spherule development; mycelial growth occurred in the one with no marble and in that inoculated with the fungus alone.

RACKEMANN (F. M.), RANDOLPH (T. G.), & GUBA (E. F.). **The specificity of fungous allergy.**—*J. Allergy*, ix, 5, pp. 447–453, 2 diags., 1938.

The specificity of extracts of *Cladosporium fulvum* was strikingly demonstrated by intradermal tests on four patients contracting asthma when exposed to spores of the mould in a commercial greenhouse [*R.A.M.*, xvi, p. 676]. All reacted strongly to the leaf mould fungus but showed little or no response to other species of *Cladosporium*. Passive transfer of the skin test to normal persons was effected in all four cases. The bearing of these observations on the study of fungal allergy [ibid., xvii, p. 599] is discussed.

MARTIN (D. S.). **The antigenic similarity of a fungus Cadophora americana isolated from wood pulp to Phialophora verrucosa isolated from patients with dermatitis verrucosa (chromoblastomycosis).**—*Amer. J. trop. Med.*, xviii, 4, pp. 421–426, 1938.

Cadophora americana, isolated from wood pulp and morphologically very similar to *Phialophora verrucosa* [*R.A.M.*, xvii, p. 178], associated with human chromoblastomycosis, was found to be equally closely related antigenically to the pathogen of man, whereas five other *C.* spp. from wood pulp morphologically distinct from *P. verrucosa*, viz., *C.* [*P.*] *lagerbergii*, *C.* [*P.*] *brunnescens*, C. [*P.*] *melinii*, *C.* [*P.*] *fastigiata*, and *C.* [*P.*] *repens*, differed likewise in their complement fixation reactions. The latter are thus of definite value in supplementing morphological criteria for the differentiation of human pathogens and those isolated from natural sources.

LYLE (E. W.). **The black-spot disease of Roses, and its control under greenhouse conditions.**—*Bull. Cornell agric. Exp. Sta.* 690, 31 pp., 2 figs., 1938.

A full description is given of studies conducted at Cornell on rose black spot (*Diplocarpon rosae*) [*R.A.M.*, xvii, p. 682], and its control, already noticed in part from another source [ibid., xv, p. 722]. The results obtained [which are tabulated and discussed] showed that in greenhouses the organism is either being carried over from one season to the next on leaves left on the plants during pruning, or introduced into the houses on infected plants during replanting. Besides the leaves, the sepals, receptacles, flower stems, and canes may be attacked and premature defoliation may reduce the number of leaves by as much as 20 per cent. Under favourable conditions all varieties of greenhouse roses are affected, though some, including Double White Killarney, Talisman, Mrs Franklin D. Roosevelt, and Souvenir are less susceptible than others.

Data obtained from outdoor roses showed an average of 32,000 conidia per leaf spot, the latter averaging 6·3 mm. in diameter. Tests of the possibility of dissemination by air currents gave negative results and dissemination is evidently accomplished mainly by splashing water

[loc. cit.]. The optimum temperature for germination was found to be about 26° C., the minimum about 15°, and the maximum approximately 33°. Spores did not germinate unless wetted with water, but if wetted for only a brief period they then germinated readily in 100 per cent. relative humidity, and germination occurred (15 per cent.) even after the wetted spores were dried for 48 hours. In the greenhouse, lesions became visible within five to ten days of initial infection and acervuli matured a day or two later. The under side of the rose leaf was somewhat more susceptible to infection than the upper.

Detailed information is given on control experiments. Effective control resulted from withholding syringing, and spraying against red spider [*Tetranychus telarius*] with selocide (1 in 300) plus new evergreen spreader (a pyrethrum-oil soap product) at 1 in 1,000. In the first five tests (with no unsprayed areas as controls) this gave from 95·7 per cent. reduction of black spot in 76 days (Rapture variety) to 99·9 per cent. reduction in 130 days (Sweet Adeline variety), while in a further three tests (control areas syringed but not sprayed) it gave 66·9 per cent. reduction on the Premier Supreme variety in 33 days and 92·3 per cent. reduction in 94 days, 86·3 per cent. reduction on Rapture roses in 72 days, and 99·8 per cent. reduction on Pernet in 140 days. The cost of labour and material for spraying was not more than twice that of syringing.

To avoid plant injury from the combination of selocide with vaporized sulphur about a week should elapse between using selocide at concentrations of 1 in 300 or higher and volatilizing sulphur from the pipes, and vice versa. Dusting sulphur may be used safely instead of vaporized sulphur for the control of rose mildew [*Sphaerotheca pannosa*], if this develops while selocide spraying is in progress.

Goto (K.). **Anthracnose of Digitalis caused by Colletotrichum fuscum Laubert.**—*Ann. phytopath. Soc. Japan*, viii, 1, pp. 1–8, 4 figs., 1938. [Japanese, with English summary.]

Digitalis purpurea leaves affected by anthracnose in Japan bear purplish-brown, circular or bluntly angular spots, averaging 1 but up to 3 or 4 mm. in diameter, scattered over the surface, while small, fusiform, sunken, blackish-brown lesions are formed on the large veins and petioles. Black, pulvinate or disciform, often confluent acervuli, 24 to 120 μ in diameter, are produced on the light brown centres of old lesions, and hyaline, rod-shaped conidiophores arise from the pseudoparenchyma, tapering towards the apex and of about equal length with the hyaline, continuous, long-elliptical to cylindrical, straight or slightly curved conidia, 12 to 21 by 3·5 to 4·5 μ. Dark brown, straight or flexuous, 3- to 5-septate setae, 75 to 120 μ in length, 4·5 to 7 μ in basal width, tapering and becoming hyaline towards the apex, are produced in profusion. Good growth is made on agar media, one strain of the causal organism producing acervuli with setae and conidia, while others give rise only to an olivaceous mycelium. Inoculation tests resulted in the infection of uninjured leaf blades and petioles and damping-off of seedlings.

The following anthracnose fungi have previously been recorded on *D. purpurea*, namely, *Gloeosporium digitalis* E. Rostr., *Colletotrichum*

fuscum Laubert (*Gartenwelt*, xxxi, p. 674, 1927), *C. digitalis* (E. Rostr.) Moesz [*R.A.M.*, xi, p. 328], and *C. digitalis* Unamuno [ibid., xiii, p. 596]. The Japanese fungus approximates most closely to *C. fuscum*, with which it is accordingly identified. The fungus studied by Moesz is also probably only a form of the same species and Unamuno's species is probably a synonym. *G. digitalis*, forming large, dark brown spots, with its smaller conidia (8 to 10 by 3 to 4 μ) and absence of setae, is regarded as distinct.

Boughey (A. S.). **Honey fungus as a disease of Rhododendron.**—*Gdnrs' Chron.*, civ, 2692, p. 84, 5 figs., 1938.

A considerable number of *Rhododendron* plants, especially [*R.*] *sanguineum*, but also of [*R.*] *lapponicum* and [*R.*] *saluenense* grown in the Royal Botanic Garden, Edinburgh, on a 'rootery' constructed by half burying old tree stumps, were found to be dead or dying from an attack by *Armillaria mellea* [*R.A.M.*, xii, p. 696], the rhizomorphs of which could be traced back through the soil to some of the stumps, up to a distance of 30 ft. The leaves became yellow, later brown, and fell, and after the mycelium had completely girdled the stems at the base the upper parts of the plants shrivelled and died. The fungus appeared to be able to form a mycelium only in fairly fresh timber and it is, therefore, recommended that stumps to be used for a 'rootery' should be set aside for four or five years. The ground chosen for the 'rootery' should be carefully cleared of all old wood and treated with a soil fungicide.

Buchwald (N. F.). **Riddersporens Pletbakteriose (Phytomonas delphinii).** [Spot bacteriosis of Larkspur (*Phytomonas delphinii*).]—Reprinted from *Gartnertidende, 1938*, 38, 2 pp., 3 figs., 1938.

Black spot of *Delphinium* (*Phytomonas* [*Bacterium*] *delphinii*) [*R.A.M.*, xvi, p. 798] was first observed in Denmark in 1937 on *D. hybridum* and again appeared in 1938 on the Lize, Rosenlust, and Turquise varieties of *D. elatum*. The causal organism was isolated from the brown, necrotic tissues underlying the pitch- to tar-black, diffuse, sometimes confluent lesions on the leaves. In addition to the usual cultural measures the writer recommends the application to the soil of copper-containing washes during the phase of emergence in the spring and repeated treatments with Bordeaux mixture throughout the growing period.

Neergaard (P.). **Phyllosticta aspidistrae. En for Danmark ny Aspidistra-Sygdom.** [*Phyllosticta aspidistrae.* A new *Aspidistra* disease for Denmark.]—Reprinted from *Naturen og Hjemmet, May, 1938*, 1 p., 1 fig., 1938.

Phyllosticta aspidistrae Oudemans, which is characterized by non-septate, elliptical conidia measuring 7·5 by 2·5 μ, was isolated in April, 1938, at the Ohlsen Phytopathological Laboratory, Copenhagen, from the black, raised pycnidia occupying some of the large, irregular, chestnut-brown lesions on the leaves of an indoor plant of *Aspidistra lurida*, this being the first record of the fungus in Denmark. Control

measures should include the removal and destruction of diseased foliage and treatment of the healthy leaves with a standard fungicide.

KLAUS (H.). **Stengelfäule an Kalanchoë.** [Stem rot of *Kalanchoë*.]—*Blumen- u. PflBau ver. Gartenwelt*, xlii, 29, p. 340, 1938.

This is a popular note on the stem rot of *Kalanchoë blossfeldiana* caused by *Phytophthora cactorum* in German nurseries [*R.A.M.*, xvi, p. 537] and its control by appropriate cultural measures (including the sparing use of nitrogenous manures) and spraying with Bordeaux mixture.

BLUMER (S.). **Ueber zwei parasitische Pilze auf Zierpflanzen.** [Concerning two parasitic fungi on ornamental plants.]—*Mitt. naturf. Ges. Bern, 1937*, pp. 17–25, 1 pl., 1938.

Impatiens parviflora was attacked at Berne in 1936 by *Puccinia komarowi* Tranzsch., this being the first record of the rust in Switzerland. Inoculation experiments with aecidiospores and uredospores of the rust gave positive results on the original hosts, *I. firmula*, *I. capensis*, *I. balsamina* (very severe infection in the form of circular, pale, later brown lesions bearing uredosori on the under side of the leaves), and *I. scabrida*. The protection of *I. balsamina*, a popular ornamental, necessitates the drastic extermination of *I. parviflora*.

Alyssum saxatile and its vars. *citrinum* and *compactum* (hort.) are extensively infected in the Berne district by a gall-producing *Peronospora* characterized by profusely branched conidiophores 400 to 800 μ in height, ending in curved prongs, 10 to 22 μ in length (average 15 to 17 μ), and ellipsoid or globose conidia, 12 to 22 by 11 to 21 (16 to 19 by 14 to 17 μ). Negative results were obtained in inoculation experiments on other *A.* spp. and a number of crucifers, and the fungus is considered to be a new species, *P. galligena* [with a Latin diagnosis], presenting a highly specialized form of the group species *P. parasitica*.

TAVEL (C[ATHERINE] v.). **Die Schusslöcherkrankheit des Löwenmauls, Heteropatella antirrhini.** [The shot hole disease of Snapdragon, *Heteropatella antirrhini*.]—*Mitt. naturf. Ges. Bern, 1937*, p. xx, 1938.

The so-called 'shot hole' disease of the snapdragon [*Antirrhinum majus*] due to *Heteropatella antirrhini* [*R.A.M.*, xvi, p. 278] was observed in the writer's garden at Berne in the summer of 1936, this being apparently the first record for the Continent. The leaves were covered with necrotic spots, which fell out and caused the typical 'shot hole' aspect. Severe damage was further noted in a late summer frame sowing.

HOGETOP (C.). **Uma doença fungica do Tremoço.** [A fungal disease of the Lupin.]—*Rev. agron.* [*Brazil*], i, pp. 346–350, 1937. [Abs. in *Zbl. Bakt.*, Abt. 2, xcviii, 25–26, p. 486, 1938.]

White lupins (*Lupinus albus*), the cultivation of which as a green manure has recently been started in Brazil, were severely damaged in 1937 by the brown spot disease due to *Ceratophorum setosum* [*R.A.M.*, xvii, p. 686]. Young plants are frequently killed following

complete defoliation, and a reduction of yield invariably ensues. Infection is spread by means of the conidia, which remain viable for a long time in the soil, or by diseased seed, the former method probably being the more usual. Attempts to combat the fungus by fungicidal treatment having given negative results, cultural measures (probably including quinquennial crop rotation) are tentatively recommended for the control of the disease.

Mann (H. H.). **Investigations on Clover sickness.**—*J. agric. Sci.*, xxviii, 3, pp. 437–455, 1938.

The author states that in his opinion what the English farmer commonly understands by the term 'clover sickness' of a soil is not so much a condition under which clover crops fail to establish themselves or die either generally or in patches, chiefly during the autumn following the sowing (from attacks by a parasitic disease such as *Sclerotinia trifoliorum*), as one in which the soil is incapable of producing a properly sized plant of clover. Such dwarfing may occur in the absence of *S. trifoliorum*. The intensity of the sickness may be measured by the relative size of the clover plant as compared with that produced in a normal, healthy soil of the same kind with similar manuring within a definite period. He then gives details of his investigations, started in 1931, to determine the actual primary cause of the condition, the results of which so far are stated to have been negative. Further work on the problem is in progress.

Fischer (G. W.). **Some new grass smut records from the Pacific Northwest.**—*Mycologia*, xxx, 4, pp. 385–395, 3 figs., 1938.

Notes are given on seven smuts [including two new species, with Latin diagnoses] which the author records on forage grasses in the Pacific North-west of the United States. *Ustilago hypodytes* [*R.A.M.*, xv, p. 511] was found on *Agropyron pauciflorum*, *A. inerme*, and *A. cristatum*, and *U. bullata* [ibid., xvii, p. 505] on *A. caninum* (artificial infection), *A. inerme*, *Elymus canadensis*, *E. glaucus* (artificial infection), *E. glaucus jepsoni*, and *E. sibiricus*. A smut collected twice from *A. cristatum* and once from *E. glaucus jepsoni* was shown by cross-inoculation experiments to be *U. hordei*, and a smut indistinguishable from *U. tritici*, with which it is provisionally identified, was collected on *A. sibiricum*. *U. striaeformis* was found on *A. pauciflorum*, *A. caninum*, *A. cristatum*, *A. inerme*, and *A. spicatum*, all of which are apparently new host records for this smut. The smut which in 1935 was reported on *Agrostis palustris* by Sprague as *Tilletia decipiens* (Pers.) Körnicke is described as a new species, *T. pallida*.

Goodwin (W.), Pizer (N. H.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab : Allington Pippin and Newton Wonder, 1937.**—*J. S.-E. agric. Coll., Wye*, xlii, pp. 37–41, 1938.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xvi, p. 818] conducted in Kent in 1937, Allington Pippin trees given two pre- and two post-blossom applications of cottonseed oil Bordeaux emulsion (as used in earlier tests) gave, respectively, 21·5 and 16·1 per cent. scabbed apples in two plots

sprayed annually with a fungicide since 1927, while in three control plots in the same orchard given the same treatments in 1937, but no spray treatment from 1927 to 1936, inclusive, the corresponding figures were 32·2, 14·2, and 12·5 per cent.

The same treatments on two plots of Newton Wonder trees which had been sprayed annually with a fungicide since 1927 gave, respectively, 24·3 and 23·3 per cent. scabbed fruits, as against 34·4, 23·1, and 13·2 per cent. in three plots given the same treatments in 1937, but untreated from 1927 until that year.

Muskett (A. E.), Horne (A. S.), & Colhoun (J.). **The effect of manuring upon Apple fruits.**—*Ann. appl. Biol.*, xxv, 1, pp. 50–67, 2 figs., 1938.

The effects of manuring apple trees with nitrogen, potash, and phosphate were investigated in an orchard in Northern Ireland during the years 1929 to 1932, 1930 being the only one with a good crop. Nitrogenous manuring was found to increase the nitrogen content of the fruit (from 0·0229 and 0·0430 per cent. in the control to 0·0550 and 0·0745 per cent. in the treated plots for 1930 and 1931, respectively) and the presence of nitrogen was observed to favour the growth of the tree, to induce earlier flowering, more bloom, greener foliage, and softer and greener fruit. On the other hand it increased the intensity of the attack of *Venturia inaequalis* on the fruit. The percentage weight of scabbed fruit (S) was correlated with the nitrogen content (N) of the fruit and the value of the coefficient was calculated as $r_{SN} = +0{\cdot}8292$. The mean values for the radial advance (in mm. per diem) of *Cytosporina ludibunda* [see above, p. 795] in samples of fruit from plots receiving nitrogenous manures was 0·889 in 1930, 1·08 in 1931, and 0·89 in 1932, while the corresponding figures for plots receiving no nitrogen were 0·153, 0·33, and 0·54. In 1930 the rate of radial advance for the sample from the plot treated with nitrogen only was 1·213 mm., the corresponding figures for the plots treated with nitrogen+potash, nitrogen+potash+phosphate, nitrogen+phosphate, phosphate only, potash only, and phosphate+potash being 1·249, 0·456, 0·678, 0·150, 0·082, and 0·118 mm., respectively.

Dearness (J.) & Foster (W. R.). **Coniosporium disease of Apples and Crab-Apples.**—*Canad. J. Res.*, Sect. C., xvi, 7, pp. 274–276, 4 figs., 1938.

In the spring of 1937 apples and crab-apples growing on Vancouver Island were widely affected by a new leaf disease, which on one crab-apple tree had caused over 75 per cent. defoliation, though on cultivated apples hardly any tree showed as much as 10 per cent. loss of leaves. Small, greyish-brown spots appeared on and spread along the veins and veinlets and generally branched from them in a dendriform manner. They turned nearly black as a layer of spores developed on them, sometimes darkening the entire upper surface of the leaf. As a rule, they were indistinct on the lower surface. On the fruit, the small, scattered acervuli became confluent under the greyish cuticle. This scaled off, with the result that a scab was produced over the shrunken, cracked pulp, very similar to that due to *Venturia inaequalis*. The

fungus, which is named *Coniosporium mali* Dearness & Foster n.sp. [with a Latin diagnosis] is characterized by olivaceous, oblong or slipper-shaped conidia measuring 13 to 20 by 3·3 to 8 (average about 14·9 by 5) μ, apparently sessile, or borne on fertile, brown hyphae measuring 3 to 13 (20) by 3 μ.

The varieties Grimes Golden, McIntosh Red, and Vanderpool Red were severely affected, while Alexander, Bismarck, Duchess, King, Oldenburg, Salome, Wealthy, and Yellow Newton showed less serious injury. It is probable that the disease will respond to the control measures used against *V. inaequalis*.

Lindquist (J. C.). **Muerte de Manzanos ocasionada por Phytophthora cactorum.** [Death of Apples caused by *Phytophthora cactorum*.]—*Rev. Fac. Agron., B. Aires*, xxi (*1936*), pp. 195–199, 1 pl., 2 figs., 1938.

Attention is drawn to the occurrence on Transparent de Croncelles and Patte de Loup apples in La Plata, Argentine Republic, of the trunk and root rot due to *Phytophthora cactorum* [*R.A.M.*, xvii, pp. 399, 584], which was isolated in pure culture on a number of standard media and produced sexual organs in profusion. Inoculation experiments gave inconclusive results owing to the death of both test trees and controls from another cause, but further trials have been initiated.

Fromme (F. D.) & Schneiderhan (F. J.). **Studies on black root of Apple.**—*Phytopathology*, xxviii, 7, pp. 483–490, 2 figs., 1 diag., 1938.

A high incidence of black root rot (*Xylaria mali*) occurred within two to three years on young apple trees [*R.A.M.*, xiv, p. 373] planted in thoroughly infected orchard soils in West Virginia. Of 165 two-year-old trees so exposed to the fungus, 100 (60·6 per cent.) developed from one to ten separate lesions, with extensive root and crown invasion. No evidence of any promising degree of resistance was exhibited by any of the 45 apple clones (including one of *Malus* [*Pyrus*] *zumi*) exposed to natural infection, or by 12 clonal and 11 seedling root stocks inoculated with the fungus in pure culture. In one series of tests, 86 out of 91 trees contracted the root rot.

Kunkel (L. O.). **Contact periods in graft transmission of Peach viruses.**—*Phytopathology*, xxviii, 7, pp. 491–497, 1 fig., 1938.

Periods of 8 to 14 days were found to be necessary for the transmission of peach yellows, little peach [*R.A.M.*, xvii, p. 223], and rosette [ibid., xvi, p. 329] by budding from diseased to healthy trees, except during the early spring, when the minimum times requisite were 3, 5, and 4 days, respectively. The passage of mosaic [ibid., xvii, p. 301] was more rapid (2 to 3 days in April and June inoculations; 3 to 6 in September), possibly on account of the easier establishment of plasmodesmatal connexions between the infected and healthy tissues in this case than in the other disorders under discussion.

Zeller (S. M.). **Septoria brevispora (Sacc.) Zeller renamed.**—*Phytopathology*, xxviii, 7, p. 523, 1938.

The name *Septoria brevispora* having already been used by Ellis

and Davis for a parasite of *Bromus ciliatus* (*Trans. Wisc. Acad. Sci.*, p. 99, 1903), the writer here renames his species on *Rubus* [*R.A.M.*, xvii, p. 190] *S. darrowii* n.nom.

PUGSLEY (A. T.). **Degeneration diseases of the Strawberry. The local problem and a review of the present knowledge of these diseases.**—*J. Dep. Agric. Vict.*, xxxvi, 7, pp. 358–364, 8 figs., 1938.

Strawberry crinkle and yellow edge [*R.A.M.*, xvi, p. 762; xvii, p. 694], though probably present in Victoria for some years, were not identified locally until early in 1936. In November, 1935, Melba strawberries in the Silvan district of Victoria were found to be affected by a disease resembling the American crinkle, but in addition to virus symptoms the plants wilted in the early summer during fruiting. The exact relation of the wilt to crinkle remains to be determined, but it is thought that crinkle-infected plants are unable to withstand the stress imposed on them at the commencement of the hot weather, especially if soil drainage is poor. In some plantings almost every plant was affected by the disease. In March, 1936, the affected plants were found to have produced a new crop of green leaves, but were slightly stunted and generally unthrifty and the young leaves were markedly crinkled. In the following season, the wilt stage was less evident, though in the early summer of 1937 it was again general. Crinkle symptoms were again common, though less marked, during the autumns of 1937 and 1938. The varieties Wilson's Pride and Ettersburg (?89) appeared to be much more resistant than Melba, while Tardive de Léopold, though showing a high percentage of crinkled plants, did not suffer as much loss of vigour as Melba.

In the autumn of 1937, symptoms resembling those of yellow edge appeared in a planting of Royal Sovereign strawberries (a variety not grown commercially in Victoria), though adjacent Melba plants were unaffected. In 1938, the former variety showed both diseases on one and the same plant. *Capitophorus fragariae*, the vector of both crinkle and yellow edge, is stated to be widespread in Victorian plantations.

The paper concludes with brief recommendations for control based on the literature of the subject.

SAKIMURA (K.). **Thysanoptera of Kauai with notes on the incidence of yellow spot on wild host plants.**—Reprinted from *Proc. Hawaii ent. Soc.*, x, 1, 7 pp., 1 map, 1938.

Pineapple yellow spot [*R.A.M.*, xvii, p. 331] was in 1935 reported from Kauai [Hawaiian Islands], where the general source of infection is out-field infected *Emilia sonchifolia*, and *E.* spp. 3 and 4, the abundant, highly susceptible wild hosts of the virus. The vector, *Thrips tabaci*, one of the commonest species of *Thrips* in the Island, showed a preference for the *Emilia* plants.

MARSH (R. W.) **Some applications of laboratory biological tests to the evaluation of fungicides.**—*Ann. appl. Biol.*, xxv, 3, pp. 583–604, 1938.

Details are given of laboratory experiments in which the author tested the toxicity to the spores of *Venturia inaequalis*, *V. pirina*, and

Nectria galligena collected from natural infections in the field, of 21 chemical compounds, including 11 so-called rubber (vulcanizing) accelerators, lauryl and cetyl thiocyanates, thiodiphenylamine, and seven copper compounds, both by Montgomery and Moore's methods on glass slides [*R.A.M.*, xvii, p. 405] and by the author's technique on the surface of apple and pear leaves [ibid., xvi, p. 331]. In a parallel series of experiments the effect of eight spray supplements, namely, sulphonated lorol, agral 2, methyl cellulose, sulphite lye, gelatine, lime casein, petroleum oil emulsion, and cottonseed oil on the tenacity of the sprays was determined.

The results showed that the rubber accelerators and other organic sulphur derivates which were found to be most toxic in the tests on slides, gave no promise in leaf tests of being useful in the field. In the laboratory tests with spray supplements, sulphite lye and oils emulsified with sulphite lye were shown to diminish the tenacity of the sprays, as reflected in the high percentage germination of spores for the leached slides. A slightly deleterious effect on tenacity was shown by methyl cellulose but none by sulphonated lorol, though an adverse influence was anticipated from chemical determinations by Fajans and Martin [ibid., xvi, p. 694].

In a limited number of comparative laboratory and field trials it was found that the results obtained on fungicides without supplements on leaf surfaces agree fairly well with their field performance. Lime-sulphur concentrations of 1 per cent., and concentrations of Bordeaux mixture, cuprous oxide, and cuprous cyanide equivalent to 0·1 to 0·2 per cent. copper, which showed a generally high level of fungicidal value in the laboratory leaf tests, are the concentrations actually effective for apple or pear scab in the field. The tendency, however, is for the laboratory tests to be somewhat less favourable to the fungicide than the field results. This was particularly marked in tests of fungicides with supplements, field tests showing no diminution of fungicidal value caused by the use of petroleum oil-sulphate lye emulsion with lime-sulphur [ibid., xvii, p. 696], whereas laboratory tests indicated such a reduction.

Davies (C.) & Smyth-Homewood (G. R. B.). **Investigations on machinery used in spraying. Part V. Tabulated results of nozzle tests.**—*J. S.-E. agric. Coll., Wye*, xlii, pp. 9–36, 16 figs., 1938.

In this further paper of the present series [*R.A.M.*, xvi, p. 823] detailed tables are given showing the shape of the spray pattern made, the degree of fineness of the spray, and the degree of coverage obtained with 17 types of spray nozzles tested on 5 different spray guns at Wye.

Smith (G.). **An introduction to industrial mycology.**—xii+302 pp., 127 figs., London, Edward Arnold & Co., Ltd., 1938. 16*s*.

This useful publication, written mainly for chemists and other workers with little or no previous training in biology, contains systematic descriptions and many excellent photomicrographic illustrations of fungi important in industry, belonging to the Zygomycetes, Ascomycetes and Fungi imperfecti, especially the genera *Aspergillus* and *Penicillium*. Introductory chapters deal with general morphology and

classification and the concluding ones with laboratory technique (cultivation and examination), industrialuses of fungi, and mycological literature.

GARDNER (H. A.), HART (L. P.), & SWARD (G. G.). **Mildew prevention [on painted surfaces] at Balboa, Cristobal, and Gainesville.**—*Circ. sci. Sect. nat. Paint Varn. Ass.* 558, pp. 112–132, 1938. [Abs. in *J. Soc. chem. Ind., Lond.*, lvii, 8 (*Abstr.*), p. 941, 1938.]

Data for mildew growth on panels coated with various white and coloured paints [*R.A.M.*, xvii, p. 615] after 318 days' exposure to favourable environmental conditions [in the Panama Canal zone, Colombia, and Florida] are tabulated. Zinc oxide was found to be the most resistant of the opaque white pigments. Lead phthalate produced little effect. Most of the rapidly chalking paints were immune. The addition of cuprous oxide and copper arsenite proved helpful. Mildew was not increased by the use of soy-bean and menhaden oils to give soft films. The efficacy of 48 added fungicides was established under the most exacting conditions. Ordinary soap and sodium phosphate applications are recommended for mildew removal.

BUCHWALD (N. F.). **Forslag til Udarbejdelse af fœllesnordiske Vulgaernavne paa Plantesygdomme.** [A proposal for the establishment of joint Scandinavian common names for plant diseases.]—Separate from *Beretn. N.J.F.'s Kongr., 1938*, 6 pp., 1938.

At the Congress of the Scandinavian Agricultural Union held at Uppsala, Sweden, in July, 1938, the following proposals were made in connexion with the drawing up of a collective list of Danish, Norwegian, Swedish, and Swedish-Finnish common names of plant diseases and injuries caused by viruses, bacteria, fungi, insects, and physiological or unknown factors in one or more of the Scandinavian countries (Finland included). On the basis of such a list a committee composed of representatives of each of the countries concerned will select the most appropriate designations in the three languages for the various diseases, and the completed catalogue will be published in *Nordisk Jordbruksforsking*. The Latin names of bacterial and fungal diseases will be based on the 'List of common names of British plant diseases' [*R.A.M.*, xiv, p. 325], and K. M. Smith's two books [ibid., xii, p. 776; xvii, p. 52] will constitute the foundation of the work on virus names. [The author *in litt.* states that these proposals were fully approved by the Congress and a committee was duly appointed.]

HANSEN (H. N.). **The dual phenomenon in imperfect fungi.**—*Mycologia*, xxx, 4, pp. 442–455, 4 figs., 1938.

The author states that analysis by the single-spore series method [*R.A.M.*, xi, p. 477; xii, p. 316; xiv, p. 710] of 916 isolates of imperfect fungi belonging to 30 genera showed that 485 or nearly 53 per cent. of these isolates were dual, i.e., were composed of two culturally distinct individuals. Cultures from a single spore gave rise to one of three types of growth, namely, one (*M*), producing abundant mycelium and few conidia; a second (*C*), producing many conidia and relatively less mycelium; and a third (*MC*) intermediate in its cultural characters between the other two, and most probably composed of

M and *C*. On further analysis by the same method it was found that the *M* and *C* types each invariably gave rise to cultures of their own respective type, while the third type again reproduced the three distinct types. When *M* and *C* were grown together in mixed culture, they combined, presumably by anastomosis, and reproduced the *MC* type. Besides differences in the quantity of mycelium and conidia produced, the two homotypes *M* and *C* may also differ in the structure of their mycelia. In *Phoma terrestris*, furthermore, the *M* and *MC* types produced pycnidia of the usual *Phoma* type, whereas the *C* type produced pycnidia with beaks frequently several times as long as the diameter of the pycnidium. As indicated by a few tests, the three types may also differ in virulence to their hosts; thus, for instance, the virulence of *P. terrestris* to onion roots was found to be in the decreasing order *M*, *MC*, and *C*, and of *Botrytis cinerea* to apple fruits in the decreasing order *MC*, *C*, and *M*.

Cultures of the *MC* type raised from fungi with multinucleate spores, such as *B. cinerea* and *P. terrestris*, usually varied considerably in their appearance, from nearly like *M* to almost identical with *C*; this is presumably due to the proportion of *M* and *C* nuclei these heterocaryotic cultures possess. There was evidence that in fungi with multinucleate spores the readiness with which the homotypes are obtained in single-spore series varies inversely with the nuclear number. In one strain of *B. cinerea* studied the nuclear number varied from 7 to 19 and from three to five consecutive single-spore series were required to bring out both homotypes. In *P. terrestris*, which has binucleate spores, there is only one *MC* type, and all three types invariably appear in the first series of single-spore cultures. In *Verticillium albo-atrum*, which produces mainly uninucleate spores, and in various *Fusarium* species, particularly those with few or no macrospores, it frequently happens that in the first 20-culture series only *M* and *C* homotypes are produced, and additional cultures, sometimes up to 50, are necessary to demonstrate that *M* and *C* nuclei may occupy the same spore.

The dual phenomenon appears to occur more frequently in isolates from the Sphaeropsidales and Melanconiales (70 per cent. of the 916 isolates studied) than in the Moniliales (47 per cent.). Among the two first-named orders, all the isolates of *Ascochyta pisi* (10), *Sphaeropsis* sp. (2), *Macrophoma* sp. (2), *Macrophomina phaseoli* (2), *P. terrestris* (104), *Stagonospora* sp. (1), and *Myxosporium* (2) tested were found to be dual, while among the last-named the condition was shown to occur in 144 out of 309 isolates of *B. cinerea*, 3 out of 7 *Hormodendrum* spp., 66 out of 139 of *Fusarium* spp., and 92 out of 183 of *V. albo-atrum* isolates. None of 30 conidial isolates from perfect fungi was found to be dual.

On general lines, the author considers that the evidence suggests that the nucleus rather than the cell is the basic unit of the individual [ibid., xii, p. 316], and indicates that the dual phenomenon is due to a condition of heterocaryosis. The presence of only two homotypes in the fungi analysed would suggest that the dual phenomenon is not merely an expression of genetic instability but rather an indication that duality is the normal condition for these fungi, and the frequency with which fungi were isolated in the *MC* form further suggests the normality of this condition. Though an explanation of the function

of the dual phenomenon is not offered, it is suggested that certain reactions, such as sectoring, reversion, loss of ability to sporulate, change in virulence, and the like, frequently observed under artificial culture conditions, may in many cases be best explained on the assumption that the fungi were obtained from nature in the dual heterocaryotic condition with subsequent dissociation into homotypes.

KAUSCHE (G. A.). **Über die Trennung von Virusgemischen auf Grund der unterschiedlichen Säuren-Basenempfindlichkeit ihrer Komponenten.** [On the separation of mixed viruses on the basis of the differential reaction of their components to acidity.]—*Angew. Bot.*, xx, 3, pp. 246–256, 3 figs., 1938.

The English potato variety Sharpe's Express was observed at the Biological Institute, Dahlem, to develop symptoms suggestive of tobacco mosaic mixed with viruses of the X and Y group [*R.A.M.*, vii, p. 259]. The presence of the tobacco mosaic virus was confirmed by inoculations into tobacco, and a series of experiments was performed to determine whether the tobacco mosaic virus artificially mixed with X and Y potato viruses is soil-transmissible [ibid., ix, p. 207]. These all gave positive results for tobacco mosaic virus (except in the case of a pure crystalline preparation), whereas the potato virus components were not soil-transmissible.

Using the previously described method of separating mixed viruses by subjecting them to varying P_H values [ibid., xvii, p. 616], the author succeeded in separating the virus mixture isolated from Sharpe's Express into its component parts, viz., the tobacco mosaic virus, which became inactivated after 4 days at P_H values between 7·8 and 10·0, and the virus Cs 35 [ibid., xvii, p. 764]. This is believed to be the first report of the occurrence of tobacco mosaic on potato in Germany. A virus similar to Cs 35 has been isolated from the English varieties Arran Banner, Great Scot, and Ally.

KAUSCHE (G. A.). **Über die Charakterisierung von pflanzlichen Virussolen mit kolloidem Gold.** [On the characterization of plant virus sols by means of colloidal gold.]—*Naturwissenschaften*, xxvi, 27, p. 445, 1938.

The reactions between the tobacco mosaic or X potato viruses and colloidal gold under varying experimental conditions were found to be classifiable according to Pauli's scheme (1932), and to afford a suitable method for the study of the purification of the viruses and their characterization [see preceding abstract].

LOUGHNANE (J. B.) & MURPHY (P. A.). **Dissemination of Potato viruses X and F by leaf contact.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxii, 1–5, pp. 1–15, 1 diag., 1938.

An expanded account is given of the authors' study on the dissemination of potato virus X, a preliminary report of which has already been noticed from another source [*R.A.M.*, xvii, p. 479], together with additional experimental data on the dissemination of virus F and combinations of viruses. Virus F was found to be transmissible by leaf contact in the glasshouse under the same conditions as virus X. A single case of accidental transmission of Up-to-Date streak (virus B

or X+B) was observed in an insect-proof house and, in the absence of other known means, is ascribed to leaf contact. The combination of viruses X and B is stated to be more stable than the combination X and F, and has never yet been observed to segregate. From the existing evidence it is thought that some of the potato viruses are spread exclusively by leaf contact, or similar mechanical means, e.g., virus X and the virus complex X+B; some by insects or by both biological and mechanical means, with mechanical transmission predominating, e.g., virus F; by both means with biological transmission predominating, e.g., virus Y; and some by biological means only, e.g., leaf roll virus and possibly virus A.

Clinch (Phyllis), Loughnane (J. B.), & Murphy (P. A.). **A study of the infiltration of viruses into seed Potato stocks in the field.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxii, 1–5, pp. 17–31, 1938.

This study was undertaken with the object of establishing the type and degree of virus infection arising in potato stocks growing in the seed-producing district of Donegal. The Champion and Arran Banner varieties were used for this purpose since both are susceptible to and tolerant of the principal mosaic viruses present. A list is given of all the viruses found in the country [*R.A.M.*, xvii, p. 479], comprising X (causing simple mosaic), A (veinal mosaic), Y (leaf-drop streak), F (tuber blotch), G (aucuba mosaic), X+A (crinkle), X+F (interveinal mosaic), X+Y (rugose mosaic), F+A (double virus aucuba mosaic), X+B (latent), E (latent in King Edward), and those causing leaf roll and witches' broom or wildings [ibid., xii, p. 48]. An examination of four different crops of Champion and five of Arran Banner from a stock believed to be virus-free in 1928 revealed 40 to 66 per cent. and 38 to 94 per cent. of latent X infection, respectively, no matter how isolated they had been when grown in the field in Donegal for five to seven years; 2 to 6 per cent. infection with virus A occurred in three crops, and 4 per cent. with virus B in three crops, accompanied by X in all cases; no other viruses were found. It is believed that the X infection was present at the time these stocks were propagated and subsequently spread within the crop. Seven crops of Champion from a stock proved to be virus-free in 1931, grown in moderate commercial isolation in the field in Donegal for from four to six years, showed complete absence of viruses X, Y, A, G, F F, and leaf roll. The importance of the present Irish policy of building up seed potato stocks free from all viruses, including latent X, is stressed. It is concluded that potato crops can be maintained free from viruses transmitted through contact by growing the potatoes in moderate isolation, while freedom from insect-borne viruses can be easily achieved in districts (like Donegal) where both the viruses and the vectors are scarce.

Chouard (P.) & Dufrénoy (J.). **Essai sur les conditions de contamination des Pommes de terre par les maladies à virus en haute montagne.** [An experiment to determine the conditions of Potato contamination by virus diseases in the high mountains.]—*Bull. Soc. Acclim. Fr.*, lxxxv, 1–2, pp. 40–44, 1938.

Details are given of experiments in a mountain reserve of France

which proved that selected stocks of Majestic potatoes from Eire, free from leaf roll and virus Y, are liable to contract these diseases even at high altitudes unless precautions are taken to isolate the planting site, e.g., by a pine belt [cf. *R.A.M.*, xv, p. 680], from such sources of infection as old 'degenerate' potato stands and cabbage crops infested by aphis (*Myzus persicae*) [cf. ibid., xvi, p. 551]. Living aphids were found at an elevation of 2,200 m. No infection occurred on plants raised from virus-free Dutch seed. The yields of healthy potatoes at a height of 1,850 m. above sea-level greatly exceeded those obtained in well-known centres of production in the plains.

Smith (A. M.) & Paterson (W. Y.). **The examination of variety and virus disease in Potato tubers by a chemical test.**—*Scot. J. Agric.*, xxi, 3, pp. 240–248, 1938.

This is a semi-popular account of work already noticed from another source [*R.A.M.*, xvii, p. 266].

Dennis (R. W. G.). **A new test plant for Potato virus Y.**—*Nature, Lond.*, cxlii, 3586, p. 154, 1938.

The author recently found that potato virus Y induces brown, circular, local lesions on leaves of *Lycium barbarum* seedlings about ten days after inoculation. When these lesions are very numerous, the inoculated leaves wilt and abscise; no systemic infection of the plant, however, results, as was confirmed by inoculations on tobacco and grafting experiments on susceptible potato varieties with material from the uninoculated part of the plant. The characteristic local lesions were given by inoculation with standard virus Y, a slightly different strain recovered from *Schizanthus* [*retusus*: *R.A.M.*, xvi, p. 703], and virus Hy II [ibid., xvii, p. 64: regarded by K. M. Smith as identical with potato virus Y], and were freely induced by strains of Y no longer readily sap-inoculable to tobacco. Sap from Y-infected potato, tobacco, and *S. retusus* was equally effective.

No other virus tested brought about a similar reaction, though faint local rings resulted from inoculation of *L. barbarum* with necrotic strains of viruses X and B. No visible lesions developed after inoculation with weak strains of X or potato viruses A, F, G, or the cucumber mosaic virus. A rather bright yellow mottling of the leaves resulted from infection with tomato aucuba mosaic [tobacco virus 6], this virus being recovered from the inoculated leaves. There was no evidence of the systemic infection of *L. barbarum* with any of these viruses, all of which, except virus A on potato, were obtained from infected tobacco plants. Inoculation to *L. barbarum* cannot be used to separate virus Y from a mixture of X and Y, but the reaction described may prove to be of value as a test for virus Y, especially when present in hosts other than tobacco.

Störmer (Inge). **Versuche zur Bekämpfung von Schorf und Rhizoctonia bei der Kartoffel durch quecksilberhaltige Dünge- und Beizmittel.** [Experiments in the control of Potato scab and *Rhizoctonia* by mercury-containing fertilizers and disinfectants.] —*Nachr. SchädlBekämpf., Leverkusen*, xiii, 2, pp. 45–54, 1 col. pl., 2 figs., 2 graphs, 1938.

Adequate control of potato scab (*Actinomyces*) [*scabies*] and *Rhizoc-*

tonia [*Corticium solani*] was given in recent experiments in Pomerania, Germany, on the Erstling [Duke of York] and Flava varieties by the application to the soil, preferably in the planting holes so as to secure close contact with the tubers, of 400 kg. superphosphate per hect. with the addition of 1 per cent. mercuric chloride. An acid medium (represented in this case by sandy soil with a P_H of 5) is essential for the release of the fungicidal properties of the mercury, which is immobilized in the presence of an alkaline fertilizer, such as calcium cyanamide. Of the preparations tested for Herulia tuber disinfection (by the short liquid process) 1 per cent. aretan [*R.A.M.*, xvii, p. 700] was the least injurious to the potatoes, besides being as effective (with a mercury content of only 3 per cent.) as mercuric chloride (70 per cent. mercury). Although attention in the present series of trials was directed mainly to the fungicidal efficiency of the treatments, yield increases of up to 30 per cent. were observed to result from the incorporation of mercuric chloride with soils badly infected with *C. solani*.

Burke (O. D.). **The silver-scurf disease of Potatoes.**—*Bull. Cornell agric. Exp. Sta.* 692, 30 pp., 7 figs., 1938.

A full account is given of silver scurf of the potato, caused by *Spondylocladium atrovirens* [*R.A.M.*, xvii, p. 57], responsible in 1933 for considerable losses of stored potatoes to growers of certified seed on the muck lands, near Williamson, New York. The disease is hardly noticeable at the time of harvest but increases rapidly in storage. Inoculation experiments and field counts indicated that the infection may either take place on mature tubers in the soil before harvesting or during storage. The fungus penetrates a variable number of the phellem layers, but has not been observed in the living cells below the phellem. The cells in the outer layers are loosened by the action of the fungus and are readily sloughed off. Limited field data on varietal susceptibility showed that White Gold yielded no clean tubers, and 23·8 per cent. slightly, 28·6 moderately, and 47·6 per cent. severely affected tubers, whereas the heavily russeted variety U.S.D.A. Seedling No. 44537 had 95·2 per cent. clean and 4·8 per cent. slightly affected tubers, and Pioneer Rural, the next most resistant, 78·9 per cent. clean and 21·1 per cent. slightly affected tubers. Some of the russeted varieties were very susceptible. In cultural studies the optimum temperature for growth of the fungus was found to be 24° C., no growth occurring at 3° or 33°. Under controlled humidity conditions at 24° the best growth was obtained at 98·7 per cent. saturation. The fungus grew at a fairly wide P_H range (9·4 to 4·39) and was capable of adjusting the hydrogen-ion concentration of the medium (by lowering the high values and raising the low ones) in such a way that good growth occurred at any P_H at which initial growth could be obtained. In storage no new lesions were formed nor did old lesions enlarge at temperatures below 37° F. [2·8° C.] and at humidities below 90 per cent.

In trials with hot and cold chemicals both malachite green, applied for five minutes in a 1 in 100 cold solution, and a mixture of 0·5 gm. mercuric chloride with 0·5 gm. mercuric cyanide in 1,000 c.c. water, applied for five minutes, inhibited spore formation by the fungus and did not injure the tubers. Yellow oxide of mercury [ibid., xvi, p. 57 *et passim*]

dip (2 lb. to 30 gals.) reduced spore formation but did not inhibit it completely; used as a soil treatment (11·5 lb. per acre) this substance showed some promise, the treated plots yielding 10 per cent. potatoes affected with silver scurf as against 38 per cent. in the control plots. Prompt digging of the tubers at maturity and adequate adjustment of the temperature and the relative humidity of storage houses are considered promising protective measures against the spread of the disease.

Petty (M. A.). **Potato spraying experiments in Louisiana during 1936–1937.**—*Amer. Potato J.*, xv, 7, pp. 189–191, 3 graphs, 1938.

The results of experiments to determine the value of spraying Houma and Triumph potatoes in Louisiana in 1936–7, using 4–4–50 Bordeaux mixture, with and without wyojel [*R.A.M.*, xvi, p. 478], indicated that the practice is profitable only when early blight [*Alternaria solani*] appears about a month before digging. In 1937, when the disease was absent, the treatment actually caused reductions in yield estimated at up to $53.70 per acre. The highest net profit in 1936 of $27.20 per acre was obtained from three applications of Bordeaux to Triumphs, the corresponding figure for five treatments of Houmas with the fungicide plus wyojel being $24.40.

Imura (J.). **On the effect of sunlight upon the enlargement of lesions of the Rice blast disease.**—*Ann. phytopath. Soc. Japan*, viii, 1, pp. 23–33, 1938. [Japanese, with English summary.]

In order to determine the effect of sunlight on the enlargement of the lesions caused by *Piricularia oryzae* on rice leaves [*R.A.M.*, xvii, p. 767], potted seedlings were transferred straight from the inoculation chamber to four series of boxes (1) uncovered, (2) covered with one white cotton sheet, (3) covered with two white cotton sheets, and (4) covered with black paper. The maximum extension of initial infection took place on the slightly shaded seedlings, the minimum on those kept in the dark, but as time advanced the plants in the unshaded boxes showed the highest degree of lesion enlargement. In pure culture on potato dextrose agar containing 1 per cent. dextrose the fungus tended to develop more freely in comparative obscurity, although the differences in its growth under varying light intensities were not striking. The reaction of *P. oryzae* to shading in the early stages of infection is attributed to the direct influence of sunlight on its growth, as well as to the indirect effects of changes in the host vitality. In the later phases of the disease the diminution of assimilation products in the host clearly influences the response of the fungus to shading.

Beeley (F.). **Annual Report. Pathological Division.**—*Rep. Rubb. Res. Inst. Malaya, 1937*, pp. 128–156, 1938.

The question of the most economic method of procedure for eradicating root disease of *Hevea* rubber (*Fomes lignosus*, *F. noxius*, and *Ganoderma pseudoferreum*) [*R.A.M.*, xvii, pp. 62, 624] when replanting old rubber areas still arouses controversy in Malaya. On some estates the areas to be replanted are dug over uniformly to a depth of 18 to 24 in. and all roots are removed, even if healthy. On others, the trees

are merely cut off at ground-level and eradication effected solely by routine treatment in the replanted stand. The most economical form of eradication would appear to lie between these extremes. To test this, two full-scale field experiments were laid down to compare statistically the method of selective patch-digging [ibid., xvii, p. 62] with the chief alternative methods, full details of which are given.

On a hilly estate, where the trunks and branches of the felled rubber were used to support the edges of the terraces, brown root rot (*F. noxius*) [ibid., xv, p. 345] appeared among *Tephrosia vogelii* cover plants below the logs on the banks of the terraces. There being no evidence that the logs had become infected by contact with the soil or with buried infected roots, the infection was attributed to wind-borne spores. The indicator plants were carefully watched, and all infected logs destroyed, with the result that the outbreak was quickly controlled.

Even under 'forestry' conditions, comparative safety from mouldy rot (*Ceratostomella fimbriata*) [ibid., xvii, p. 62] can be assured if the covers are slashed to 2 ft. just before the onset of the wet season, and clean-cleared rentices 8 ft. wide are provided along the rows to promote the movement of air currents and ensure a more rapid drying of the bark after dew or rain.

Of the bark cankers previously reported as due to physiological disturbance [ibid., xvi, p. 60], those left untreated appear to have remained inactive, while those deeply scraped have regenerated healthy bark.

Kursanoff (L. I.) & Shklyar (T. N.). Сравнительное изучение микофлоры московских и батумских почв. [A comparative study of the fungus flora of soils from Moscow and Batum.]—*Bull. Soc. Nat. Moscou*, Sect. biol., N.S., xlvii, 3, pp. 223–232, 1938. [French summary.]

With the object of disclosing differences in the biological activities of fungi in soils of different composition and of different geographical origin the authors examined five specimens of soil from Ostankino (55° N.) near Moscow, taken from woodlands and from tree nurseries, cultivated and manured for five years, and five specimens of soil from Gonio (41° 45′ N.) near Batum [Caucasus] taken from woods and grasslands and from a citrus plantation, cultivated and treated with manure and chemical fertilizers for ten years. About half the species were common to both groups of soils. Among the 44 fungi listed, are *Botrytis epigaea*, *Clasterosporium carpophilum*, *Diplocladium macrosporium*, *Diplosporium album*, *Hormodendrum pallidum*, *Helicoon tubulosum*, *Monosporium acuminatum*, *Spicaria decumbens*, *Tilachlidium humicola*, *Verticillium glaucum*, *Mortierella pusilla*, 11 species of *Mucor*, *Thamnidium elegans*, *Zygorrhynchus heterogamus*, and *Z. mölleri*. The differences in the microflora of the two groups of soils became more apparent in further studies. The average number of fungal spores per gm. of soil, calculated from the results of five replications, was 54,000 for all five specimens of southern soils from Gonio and 119,000 for the northern soils from Ostankino. Species of *Penicillium* were prevalent in both the northern and the southern soils,

amounting to 66·5 and 68·8 per cent., respectively; and were followed by *Trichoderma* (16·9 per cent.) and *Fusarium* (4·2 per cent.) in the former and *Aspergillus* (8·9 per cent.) and *Trichoderma* (4·5 per cent.) in the latter. On the whole Hyphomycetes predominated in southern soils and Mucorales in those of the northern area. The cultivated and manured soils of both groups contained larger numbers of fungi, especially Mucorales, than the uncultivated. The relative capacity of different species of fungi to decompose cellulose was tested in Cholodny's soil chamber [ibid., xvii, p. 554], into which a few fibres of cotton wool were introduced. Of the cellulose-destroying fungi present in northern soils the most frequent was *Trichoderma lignorum*, followed in order by *T. koningi*, *Penicillium* spp., *Acrostalagmus albus*, *Fusarium* spp., and *Tilachlidium humicola*; whereas with the southern soils the sequence was: *Penicillium* spp., *Aspergillus* spp., *Acrostalagmus albus*, *Trichoderma lignorum*, *T. koningi*, *Alternaria humicola*, and *Cephalosporium acremonium*. The fungi present in the southern soils were found collectively to decompose cellulose more rapidly than those in the northern; individually the species *T. lignorum* and *T. koningi* were the most active in both groups of soils. The individual activity of the fungi was measured both by the number of days needed to decompose a given amount of cellulose and by the percentage of cellulose decomposed during a given number of days. It appears from these results that the biological activity of the different species is directly correlated with their degree of prevalence in the soil.

Milovtzova (Mme M. O.). Нові види грибів на лікарських і етероолійних рослинах УРСР. [New species of fungi on the medicinal and essential oil plants of the Ukraine.]—Труд. Інст. Бот. Харк. Держ. Унив.—[*Trav. Inst. Bot. Univ. Kharkoff*], ii, pp. 7–13, 4 figs., 1937. [Received July, 1938.]

The author describes and gives the Latin diagnoses of several new species, forms, and one new variety, of fungi found on cultivated and wild medicinal plants in the vicinity of Kharkoff. *Ophiobolus origani* n.sp., *Camarosporium origani* n.sp., and *Diplodina origani* n.sp. are stated to occur on the dry stems of *Origanum vulgare*. *Macrosporium digitalis* n.sp. causes rounded spots 1·5 to 3 mm. in diameter on living leaves of *Digitalis ambigua* and *D. purpurea*; it has straight, cylindrical, dark olive conidiophores, either scattered or in groups of two or three, 55 to 76 by 5 to 8 μ, and clavate conidia, brown with a paler apex, 88 to 136 by 12 to 24 μ, with 5 to 9 transverse and 1 to 2 longitudinal septa. *Erysiphe cichoracearum* f. *carthami* n.f. and *Bremia lactucae* f. *carthami* n.f. were found on living leaves of *Carthamus tinctorius*, and *Urocystis anemones* var. *adonis* n.var. occurred on the leaves, stems, and flowers of *Adonis vernalis*.

Salmon (E. S.) & Ware (W. M.). **The downy mildew of the Hop in 1937.**—*J.S.-E. agric. Coll., Wye*, xlii, pp. 42–46, 1938.

An account is given of the hop downy mildew [*Pseudoperonospora humuli* : *R.A.M.*, xvii, p. 374] situation in England in 1937, when early outbreaks ceased, following dry weather, and the crop gathered was free from infection. Data are supplied showing that for the sixth successive

year rainfall did not exceed the normal in both July and August, and the authors consider that this has largely contributed to the prevention of a major disaster to the hop crop in those years.

Cottonseed oil-Bordeaux mixture was favourably reported on by a number of Kentish growers as possessing improved wetting qualities and reducing the wear of the pumps. It also gave excellent results in two gardens in which it was tested by the authors.

All of ten laterals of the Fuggles variety heavily sprayed in full burr with cuprous oxide [ibid, xv, p. 283], the 'brush' being thoroughly wetted, subsequently bore well-developed, uninjured cones with as many seeds as those in adjacent, unsprayed laterals.

Bouriquet (G.). **Les maladies de la Canne à Sucre à Madagascar.** [Sugar-Cane diseases in Madagascar.]—*Agron. colon.*, xxvii, 247, pp. 1–17, 1938.

In this semi-popular account of the principal diseases of sugar-cane, with special reference to conditions obtaining in Madagascar, the author states that no streak or mosaic has so far been found on the island, though *Aphis maidis* is present. The Port Mackay variety frequently shows variegation (large, white, longitudinal bands on the leaves), the cause of which is not known, but appears to be unharmed by it. *Leptosphaeria sacchari* [*R.A.M.*, xvi, p. 127] has been noted in various localities, on all varieties, including *Saccharum spontaneum*, but is very rare in the west, where the sugar-cane is stated to be extraordinarily healthy. No control methods are considered necessary. Leaf scald (*Bacterium albilineans*) was observed in June, 1935, in one locality (Nossi-Bé). Smut (*Ustilago scitaminea*) [ibid., xvii, p. 97] was also found at Nossi-Bé in June, 1935; locally, the spores are round, 6 to 8·5 μ in diameter, and have a smooth, brown membrane. Sooty mould occasionally appears on the eastern side of the island, but is of negligible importance. *Coniothyrium* [*Pleocyta*] *sacchari* [ibid., xvi, p. 796; xvii, p. 66] was found in December, 1930. *Schizophyllum commune* has been found on old cane wood, but never on living cane. Root rot associated with *Dictyophora multicolor* [ibid., xi, p. 128] was first observed locally in 1930. *Colletotrichum falcatum* has been reported from Madagascar but has never been observed by the author.

Kiryu (T.). **Studies on the physiological characters of Cercospora vaginae Krüg.**—*Rep. Govt Sug. Exp. Sta. Tainan*, 5, pp. 53–72, 2 pl., 2 graphs, 1938. [Japanese, with English summary.]

The best of the ten solid media tested for the development of *Cercospora vaginae*, the agent of the red spot of the sugar-cane leaf sheath [*R.A.M.*, xvi, p. 127] now prevalent in Formosa, Japan, was found to be potato sucrose agar (15 per cent. sucrose). The temperature range for growth was from 7° to 37° C., with an optimum at or near 28°. *C. vaginae* developed throughout a hydrogen-ion range of P_H 1·3 to 12·5, the optimum lying between 5·6 and 6. The addition to the agar media of 0·3 to 0·5 per cent. common salt stimulated growth, while the fungus was able to tolerate up to 5 per cent. The aerial mycelium and conidia of the fungus were found to grow somewhat better in the light than in darkness, although development as a whole was favoured

by obscurity. Exposure to moist heat at a temperature of 55° for 30 minutes or 58° for 5 minutes killed the mycelium and conidia of *C. vaginae*.

KIRYU (T.). **Studies on the Cytospora sheath disease of Sugar Cane. Part I. Studies on the physiological characters of Cytospora sacchari Butl.**—*Rep. Govt Sug. Exp. Sta. Tainan*, 4, pp. 172–194, 2 pl., 2 graphs, 1937. [Received September, 1938.]

The *Cytospora* sheath disease of sugar-cane, caused by *C. sacchari* [*R.A.M.*, xvi, p. 341], is stated to be prevalent in the southern part of Formosa, especially where P.O.J. 2883 is cultivated. In culture the mycelium grew best on soy-bean agar and less well on the following agar media in declining order: sugar-cane stem, onion, potato sucrose, Pfeffer's, modified albumin, Czapek's, and sugar-cane leaf, but aerial development was most abundant on sugar-cane leaf, potato sucrose, and soy-bean agars. The fungus grew at temperatures ranging from 7° to 37° C., with an optimum at about 31°. It was able to grow on agar media containing from 0 to 30 per cent. sucrose, but the optimum concentration was 10 per cent. The addition of common salt to the medium was tolerated to a maximum of 5 per cent., the optimum concentration being 0·5 per cent. Growth of the fungus took place between P_H 1·2 and 9·8, the optimum being 4 and 3·0 to 5·0 giving quite good results. Darkness was more favourable to growth than light, though the aerial mycelium developed rather better in the light than in the dark. The mycelium of the fungus was killed at 49° (moist heat) after 30 minutes' exposure and at 52° after 5 minutes.

Chlorotic streak in Louisiana. Committee Report, American Sugar Cane League.—*Sug. Bull., New Orleans*, xvi, 18, pp. 2–3, 1938. [Abs. in *Facts ab. Sug.*, xxxiii, 10, p. 74, 1938.]

Chlorotic streak [fourth disease] of sugar-cane [*R.A.M.*, xvii, p. 345] appears to have evaded the quarantine regulations and become established in Louisiana, where it is particularly prevalent on C.P. 29-320 and other C.P. types as well as on Co. 281; Co. 290, on the other hand, has hitherto been free from infection. The symptoms of the disease are briefly described.

BELL (A. F.). **Downy mildew disease of Cane.**—*Cane Gr. quart. Bull.*, vi, 1, pp. 30–32, 1938. [Abs. in *Facts ab. Sug.*, xxxiii, 10, p. 75, 1 fig., 1938.]

In connexion with a popular note on downy mildew of sugar-cane [*Sclerospora sacchari*] in Queensland [*R.A.M.*, xvii, p. 772] the writer emphasizes the difficulty of detecting the white efflorescence on the leaves during the dry winter and early spring weather. The presence of the disease may be recognized at this period, however, by the sudden elongation of a proportion of the affected stalks, which are thin, soft, brittle, and stand out a couple of feet above their neighbours ('jump-up' phase). During the cool season the disease spreads very slowly and may be combated by roguing and selection of healthy planting material from sites at least a quarter of a mile distant from any known centre of infection.

Ito (S.) & [illegible]ima (Yasu). **Notae mycologicae Asiae orientalis. III.** [Mycological notes from eastern Asia. III.]—*Trans. Sapporo nat. Hist. Soc.*, xv, 3, pp. 113–128, 1938.

This further list of fungi, mostly rusts, reported from Japan and the Far East [*R.A.M.*, xv, p. 829] includes *Phakopsora nishidana* S. Ito n.sp. (*P. fici* Nishida nom. nud.) [with a Latin diagnosis] found on leaves of *Ficus carica* and *F. erecta* at Kyushu. It is characterized by uredosori on the under surfaces of the leaves, found in yellow-brown, sparse or aggregated spots 0·2 to 0·3 mm. in diameter, which are at first covered by the epidermis, but are later bare and pulverulent. The sparse, peripheral or intermixed, clavate, hyaline paraphyses measure approximately 26 by 10 μ. The globose, ellipsoid or ovate, yellow or yellow-brown uredospores measure 18 to 24 by 16 to 18 μ; the verrucose epispore is approximately 1 μ thick and the germination pore dark. The subepidermal, sparse or aggregated teleutosori are present on the under surfaces of the leaves in reddish-brown spots 0·2 to 0·8 mm. in diameter. The oblong, yellow teleutospores occur in layers of 2 to 4 and measure 15 to 20 by 8 to 12 μ; the epispore is about 1·5 μ thick. A key is given to the species of *Puccinia* found on Japanese Cyperaceae.

Kirschstein (W.). **Ascomycetes.**—*Kryptogamenflora der Mark Brandenburg*, viii, 3, pp. 305–448, 11 figs., 1938.

In the last instalment of this flora [issued in 1911], the author began on the last two pages the family Mycosphaerellaceae. As his views on the nomenclature of this family have now altered, he starts afresh the account of the family adopting the name Sphaerellaceae instead of Mycosphaerellaceae and accepting the generic name *Sphaerella* in place of *Mycosphaerella*. The present fascicle contains a key to the 14 genera discussed, and comprises four new genera (including *Thyrospora* [but see *R.A.M.*, v, p. 233]), 17 new species [with Latin diagnoses], 26 new combinations, and 5 new names. Among the synonyms of the type species of *Saccothecium*, *S. sepincolum* Fr., is *Sphaerulina intermixta* (Berk. & Br.) Sacc., and the genus *Sphaerulina* is reserved for species based on *S. myriadea* (DC) Sacc.

Mix (A. J.). **The genus Taphrina. I. An annotated bibliography. II. A list of valid species.**—*Kans. Univ. Sci. Bull.*, xxiv, 9, pp. 113–149; 10, pp. 151–176, 1936. [Received October, 1938.]

The first part of this work presents a critical annotated bibliography (comprising 189 items) from 1815 onwards of the genus *Taphrina*, including *Ascomyces*, *Exoascus*, and *Magnusiella*, and in the second part a descriptive list (with references to literature, hosts, characters of the asci and spores, and distribution) is given of 104 valid and one doubtful species of *Taphrina*, eight being excluded.

Ciferri (R.). **Flora italica cryptogama. Fasc. 17. Pars 1: Fungi. Ustilaginales: Tilletiaceae, Graphiolaceae, Ustilaginaceae.** [The cryptogamic flora of Italy. Fasc. 17. Part 1: Fungi. Ustilaginales: Tilletiaceae, Graphiolaceae, Ustilaginaceae.]—443 pp., 21 figs., 2 diags., Soc. bot. ital., 1938.

This copiously annotated list of Italian Ustilaginales, preceded by

a general account of the history, morphology, biology, cytology, host relations, physiologic specialization, taxonomy, geographical distribution, and other features of the group, contains a new genus, *Ginanniella*, with its type species *G. trientalis* (*Tuburcinia trientalis* Berk. & Br.), four new species [with Latin diagnoses], and twelve new combinations. A combined host and fungus index is appended.

Liro (J. I.). **Die Ustilagineen Finnlands. II.** [The Ustilagineae of Finland. II.]—Reprinted from *Ann. Acad. Sci. Fenn.*, Ser. A, xlii, 1, xiii+720 pp., 8 figs., 1 map, 1938.

Twenty-eight new species [with diagnoses in German only] and 12 new combinations are included in this further critically annotated list of Finnish Ustilagineae [*R.A.M.*, iii, p. 369], which is divided into two main sections, the first dealing with the taxonomic aspects of the fungi enumerated and the second presenting a fully documented survey of the available information on some problematical questions concerning the biology of certain representatives of the group. A bibliography of 122 pages and a combined host and fungus index are appended.

Roger (L.). **Quelques champignons exotiques nouveaux ou peu connus. III.** [Some new or little known exotic fungi. III.]—*Bull. Soc. mycol. Fr.*, liv, 1, pp. 48–54, 1 pl. [in fasc. 2], 2 figs., 1938.

Continuing his earlier studies [*R.A.M.*, xv, p. 830], the author gives notes, with technical descriptions [in French only], on three new fungi from Africa.

Hemileia pavetticola Maubl. & Rog. n.sp., found on the leaves of *Pavetta ternifolia* in the Belgian Congo, resembles *H. coffeicola* [ibid., xiv, p. 303] but differs in that its mycelium spreads very little in the spongy parenchyma, and the haustoria are much more finely lobed.

Dothiorella sisalanae n.sp. produces broad, dry areas on the leaves of *Agave rigida* var. *sisalana* in French Guinea. Fructifications develop on both surfaces, and the mycelium forms black, subepidermal, later erumpent, round or elongated pustules. The stromata measure 400 to 800 μ long by 250 to 500 μ high, and contain one or two layers of pycnidia arranged in groups of 2 to 6 or more. When the pycnidia are isolated, which occurs occasionally, the wall is very thick, and each should be regarded as constituting a unilocular stroma. The locule averages 165 to 210 μ in diameter. The ovoid, 1-celled, hyaline spores measure 10 to 12 by 3·2 to 5·3 μ, are rounded at the extremities, and are borne on long, slender sterigmata, which may reach the same length as the spore.

Microthyriella guineensis n.sp. forms flat, black, circular, easily detachable colonies $\frac{1}{2}$ to 1 mm. in diameter on the leaves of *Coffea liberica* in French Guinea, usually on the upper surface. The brown mycelium is 16 to 20 μ thick and slightly vermiculate. Underneath the cells of the fungal crust the true wall of ascostroma is distinctly visible, and consists of light-coloured cells elongated perpendicularly to the leaf surface. The broad, short asci measure 110 to 140 by 60 to 70 μ, and contain 8 massed, rectilinear, often curved, hyaline ascospores slightly constricted at the median septum, rounded at the extremities, and measuring 70 to 100 by 14 to 18 μ.

Roldan (E. F.). **New or noteworthy lower fungi of the Philippine Islands, II.**—*Philipp. J. Sci.*, lxvi, 1, pp. 7–13, 4 pl., 1938.

An annotated list is given of twelve fungi, six of which are described [with English and Latin diagnoses] as new to science, while the remainder are recorded for the first time from the Philippine Islands [cf. *R.A.M.*, xvi, p. 209]. *Cercospora vaginae* was collected on living leaf sheaths of sugar-cane [see above, p. 839]. Living foliage of tomato is attacked by *C. fuligena* n.sp., which forms its dark brown colonies, composed of simple, fasciculate subgeniculate, septate conidiophores, 26 to 67 by 3·7 to 5 μ, on the under sides of the leaves. The conidia of the fungus are clavate to subclavate, slightly curved, subhyaline, uni- to pluriseptate, acrogenous, and measure 15 to 118 by 3·5 to 5 μ. The species is stated to differ from *C. cruenta*, reported from the United States, in producing colonies and not spots on the tomato leaves. *Cylindrosporium insularum* n.sp. produces sparse, circular, pale yellow, reddish-edged, grey-centred lesions, 2 to 30 mm. in diameter, on living leaves of *Lansium domesticum*. *Macrosporium centaureae* n.sp. forms irregularly circular, pale yellow spots, 1 to 15 mm. in diameter, with reddish-brown borders, on living leaves of *Centaurea* sp. Living cassava foliage is liable to infection by *Helminthosporium hispaniolae* [ibid., xiii, p. 147], which produces scattered or confluent, circular, light brown to pale straw-coloured spots, mostly on the old basal leaves. A serious leaf blight of the vine, characterized by the development of numerous chocolate-brown spots, 1 to 10 mm. in diameter, is caused by *Isariopsis clavispora*. *Acrothecium rubiginosum* n.sp. is recorded on living leaves of *Eurycles amboinensis*. *Piricularia cannae* n.sp., the agent of a foliar blight of *Canna indica* leaves characterized by irregular, confluent, dark brown patches, differs from *P. grisea* [ibid., xvi, p. 195] in its much larger conidia, which are ovate to piriform, septate, formed terminally in a scorpioid cyme, and measure 35 to 49 by 14 to 21 μ. Light brown, predominantly marginal, sometimes confluent patches are produced on living bean (*Phaseolus vulgaris*) leaves by *Macrophoma phaseolina* [ibid., viii, p. 743] with pycnidia 55 to 163 μ in diameter, and subcylindric conidia, 18·5 to 28 by 7·5 to 11 μ. *Phyllosticta heveae* forms light brown, concentrically zonate spots on rubber leaves [ibid., v, pp. 324, 690]. Scattered or confluent, circular, pale yellow spots, 1 to 10 mm. in diameter, with narrow, reddish-brown borders, are produced on living foliage of *Phytolacca dioica* by *Phyllosticta phytolaccae*. The ovate to piriform pycnidia and elliptical to ovate-elliptical pycnospores of *Cicinnobolus sigacollus* n.sp., parasitizing the hyphae of Erysiphaceae on *Cucurbita maxima*, measure, respectively, 48 to 81 by 41 to 56 μ and 4·5 to 7·5 by 2·5 to 3·5 μ, and are thus larger than those of *Cicinnobolus cesatii* [ibid., xvi, p. 104].

Reid (J. J.), McKinstry (D. W.), & Haley (D. E.). **Studies on the fermentation of Tobacco. 2. Microorganisms isolated from cigar-leaf Tobacco.**—*Bull. Pa St. Coll.* 363, 18 pp., 6 figs., 3 graphs, 1938.

A study of 2,844 pure culture isolations of micro-organisms from 354 samples of cured and fermenting cigar-leaf tobacco in Pennsylvania [cf. *R.A.M.*, xvii, p. 566] showed, *inter alia*, that the predominant fungi

on the cured leaf belonged to *Penicillium* and *Aspergillus*, the former genus occurring more frequently than the latter. Viable fungi disappeared entirely in the early stages of fermentation.

HOPKINS (J. C. F.). **Mycological notes. Seasonal notes on Tobacco diseases. II. Two destructive curing moulds.**—*Rhod. agric. J.*, xxxv, 7, pp. 510–512, 2 figs., 1938.

Barn rot of tobacco caused by *Rhizopus arrhizus* [cf. *R.A.M.*, xiv, p. 678] and yellow mould caused by *Aspergillus flavus* are reported to have been fairly prevalent in the barns in Southern Rhodesia in 1938 during curing, owing to high humidity, insufficient aeration, and close packing. The barn rot disease causes a softening of the midrib of the leaf at the butt end, the butts soon turning dark brown and the leaf tissues becoming wet and soggy, while a grey, mouldy growth of the fungus spreads all over the infected area. Yellow mould is not of frequent occurrence but may cause appreciable damage under conditions favouring barn rot. Not uncommonly both diseases occur on the same leaf. *A. flavus* produces small, medium-brown, circular spots scattered over the leaf, increasing in size to a diameter of about half-an-inch, with small, circular patches of the yellow fungus in the centres of many of the spots. Sometimes several spots coalesce to form large discoloured areas. This is believed to be the first record of *A. flavus* causing a leaf spot of tobacco. In order to prevent heavy losses from these diseases the growers are advised to arrange the priming so that the amount of harvested leaves to be cured should not be in excess of the available barn accommodation.

KOCH (L. W.). **Blue mold of Tobacco in Canada.**—*Lighter* (*Dep. Agric. Can.*), viii, 3, pp. 8–9, 1938. [Mimeographed.]

Tobacco downy mildew (*Peronospora tabacina*) [*R.A.M.*, xvii, p. 777] was reported for the first time in Canada on 7th June, 1938, near Essex, Essex County, Ontario, where 1,200 sq. ft. of Judy's Pride seedlings were severely damaged. Seedlings of Halley's Special variety growing on a neighbouring plantation were also affected, and the disease was subsequently discovered in other localities in the neighbourhood including one place five miles west and one 60 miles south-east of Essex. All the affected plants and all those likely to become affected were destroyed. At Harrow, 15 miles from the scene of the original outbreak, the meteorological data showed that on 27th to 29th May, inclusive, the mean temperature was 61·1° F. and the average relative humidity 82 per cent. It is suggested that the outbreak may possibly have been due to sporangia carried in the air across Lake Erie.

CLAYTON (E. E.). **Paradichlorbenzene as a control for blue mold disease of Tobacco.**—*Science*, N.S., lxxxviii, 2272, p. 56, 1938.

Experiments recently conducted in two localities of Georgia and South Carolina showed that effective control of tobacco blue mould (*Peronospora tabacina*) under greenhouse conditions was attained by scattering paradichlorbenzene crystals on boards, at the rate of 1 oz. to 4 or 5 sq. yds. of bed area; in one experiment, placing the crystals on a narrow shelf running inside and near the top of the side walls of

a bed 9 ft. wide gave adequate control of the mould throughout the bed. Treated beds were enclosed at night with muslin sheeting to retain the vapours given off by the crystals. It is pointed out that 1 oz. by weight of paradichlorbenzene was equal in effectiveness to 5 fluid oz. of benzol [*R.A.M.*, xvii, p. 777]. If these results are confirmed by more extensive tests, paradichlorbenzene will mark a step forward towards simplifying blue mould control and reducing its cost.

McKnight (T.). **Further experiments on mildew prevention in calico with special reference to Tobacco seed-bed covers.**—*Qd agric. J.*, l, 1, pp. 4–7, 1938.

In further tests with sixteen different substances for preventing moulding of calico covers used on tobacco seed-beds undergoing benzol disinfection against downy mildew [*Peronospora tabacina*: see preceding abstracts], 10 minutes' immersion in colloidal copper with agral II added as spreader resulted in no moulding of the calico after six months and the covers so treated had a strength after exposure of 66 lb. per sq. in. (i.e., pounds pressure required to fracture the cloth) and waterproofing quality of 3 minutes' duration (number of minutes taken for 90 c.c. of water to percolate through a standard depression made in the calico tied over a jar). The best all-round results were given by various treatments with alum lead acetate. When the standard schedule for this material was used, involving immersion in two solutions [*R.A.M.*, xvii, p. 77], there was slight moulding after six months, while the figures for strength and waterproofing were 96 lb. and 6 minutes, respectively. A single immersion in a combination of the two alum and lead acetate mixtures, and in the same plus either 1 per cent. glue size or 3 per cent. gelatine, gave slight to moderate moulding after six months with, respectively, strengths of 93, 91, and 95 lb. per sq. in., and waterproofing durations of 5, 10, and 210 minutes. Shirlan W.S. (1 per cent.) gave slight to moderate moulding, a strength of 57 lb. per sq. in. and a waterproofing duration of 3 minutes, the corresponding values for shirlan W.S. (0·25 per cent.) being serious moulding, 73 lb., and 3 minutes, and for shirlan AG (1 per cent.) moderate to serious moulding, 87 lb., and 3 minutes.

As a result of these tests it is recommended that the calico covers should be immersed in a solution of 2 lb. alum and 1 lb. lead acetate in 10 gals. water for 24 hours, and then removed and allowed to dry.

Curtis (K[athleen] M.) & Allan (J. M.). **Tobacco mosaic in New Zealand. Incidence with reference to commercial practice in glasshouse, seedling-bed, and field, season 1937–38.**—*N.Z.J. Sci. Tech.*, A, xx, 1, pp. 1–13, 1938.

In a large-scale experiment carried out in 1937–8 in the Nelson District of New Zealand with the co-operation of two of the principal tobacco companies no evidence was obtained that the customary practice of raising tobacco seedlings in commercial glasshouses in which tomatoes are regularly grown is responsible for infecting the young tobacco seedlings with mosaic. The tabulated results showed that under the experimental conditions the raising of tobacco seedlings in glasshouses not used for tomatoes did not prevent the development of

mosaic in the seedlings in the bed. Furthermore, when the beds were treated with formalin applied at the rate of 12 gals. of 4 per cent. solution per bed (12 ft. by 4 ft.) before pricking out seedlings raised in a non-tomato glasshouse, no mosaic occurred at the bed stage, but the disease appeared in the field after transplanting. The marked increase in infection that occurred between the bed and field recordings indicates the importance of the bed phase (from pricking out to transplanting) in the multiplication of mosaic. Handling and cultural operations after planting in the field were less important in promoting spread than they were during the bed phase, as secondary field infection took place too late seriously to affect the development of the crop leaves.

Stanley (W. M.). **Isolation and properties of Tobacco mosaic and other virus proteins.**—*Bull. N.Y. Acad. Med.*, Ser. 2, xiv, 7, pp. 398–428, 4 figs., 1 diag., 3 graphs, 1938.

In this paper (Harvey Lecture, 17th March, 1938) the author traces the history of viruses from the first mention of invisible living agents as possible causes of disease by Varro and Columella (*c.* 100 and 60 B.C., respectively) to the most recent discoveries in this field of research, with special reference to tobacco mosaic. The implications of the latest evidence on the physical, chemical, biological, and serological properties of virus proteins are discussed in an interesting and suggestive manner [cf. *R.A.M.*, xvii, p. 407].

Hills (C. H.) & Vinson (C. G.). **Particle size of Tobacco mosaic virus.**—*Res. Bull. Mo. agric. Exp. Sta.* 286, 18 pp., 2 graphs, 1938.

The particle size of the tobacco mosaic virus [*R.A.M.*, xvii, p. 707] was calculated in diffusion experiments in the following way. Four different solutions of the virus obtained from the juice of diseased plants of Turkish tobacco and having a P_H value of about 5·0 were allowed to diffuse into a certain volume of distilled water. The virus concentrations of the diffusates were determined by the half-leaf method of Samuel and Bald [ibid., xii, p. 526], using the leaves of *Nicotiana glutinosa* and *Phaseolus vulgaris*. The diffusion coefficient (D) was then calculated from an equation [given in full] in which D = virus concentration of the diffusate × the volume of the diffusate. The relation between the radius of the virus molecule (r) and D being developed from Einstein's equation [also given in full], the average value of r was now calculated from 9 diffusion experiments as $4{\cdot}09 \pm 0{\cdot}31\ \mu\mu$. In the presence of trypsin the average value of r was $17{\cdot}40 \pm 1{\cdot}59\ \mu\mu$; this increased particle size is probably due to the adsorption of trypsin by the virus and such an adsorption was also indicated by the more rapid diffusion of trypsin (33·6 per cent. greater) from a trypsin solution free from virus than from one containing virus. The isoelectric points of the protein particles in highly purified virus preparations from Turkish tobacco, *N. macrophylla*, and Marglobe tomato were calculated from viscosity measurements as P_H $3{\cdot}6 \pm 0{\cdot}1$.

Moore (E[nid] S.) & Hean (Miss A. F.). **Frenching of Tobacco.**—Reprinted from *Fmg S. Afr.*, xiii, 2 pp., 3 figs., 1938.

A brief, popular account is given of the symptoms and etiology of

tobacco frenching [*R.A.M.*, xvi, p. 637], which has recently been observed for the first time in the Union of South Africa. Only a few cases have been observed locally, either in the seed-beds or the field, and in every instance the soil conditions were found to be unsuitable for tobacco.

Moore (E[nid] S.) & Retief (D. F.). **Mildew or white rust of Tobacco.** —Reprinted from *Fmg S. Afr.*, xiii, 2 pp., 1 fig., 1938.

In this popular note the authors state that the advent of flue-curing of tobacco in South Africa has rendered mildew (*Erysiphe cichoracearum*: *R.A.M.*, xvi, p. 780; xvii, p. 295] of much more serious import than it was formerly, since leaves that when harvested showed only a trace of infection become so badly marked during flue-curing as to be worthless.

In two seasons' tests in which plots were dusted (A) one month or (B) two months after planting with finely divided, high quality sulphur, precautions being taken to minimize the risk of sulphur blowing from one plot to another, the disease was scarce even in the controls in the first season, but in the second infection was severe on the untreated controls, and the efficacy of the treatment was fully confirmed. The single application gave several weeks' protection, and at harvest time the plots in series A had considerably less infection than the controls: the plots in series B had even less disease than series A. Appreciable quantities of sulphur were, however, demonstrated to be present, by chemical analysis at harvest time, on all the leaves of the dusted plants, and sulphur was even recovered from leaves that had developed after the dusting. To what extent the sulphur is removed during air or flue-curing is not yet known, but the treatment is unreservedly condemned. Applications of sulphur to the soil at the rate of 60 lb. per acre before planting failed to control the disease. Growers are advised to make a fuller use of priming for control purposes [ibid., xv, p. 470].

Birch (T. T. C.). **A synopsis of forest fungi of significance in New Zealand.**—Reprinted from *N.Z. J. For.*, iv, 2, 17 pp., 1937. [Issued as *Bull. N.Z. For. Serv.* 9, 1938.]

This is a list of 62 of the more important species of forest fungi in New Zealand together with the names of the hosts affected, the world geographical distribution of the fungus species, notes on their pathogenicity, and book references. A preliminary list of 7 mycorrhizal fungi is appended.

Wakefield (W. E.). **Brown-stain in Sugar Maple. Its effect on the mechanical and physical properties.**—*Circ. For. Serv. Can.* 53, 8 pp., 3 figs., 1938.

Canadian sugar maple (*Acer saccharum*), used for the manufacture of last-blocks for boots and shoes, occasionally shows in the region adjacent to the pith a dark brown discoloration, which may occupy from 50 to 75 per cent. of the total area of the cross-section of the log. This dark wood, usually referred to as 'brown heart', is surrounded by a lighter band known as 'white' maple. The results of comparative strength tests demonstrated that no weak plane occurred at the juncture

of the brown heart and white wood, and that there is no clearly defined difference between the strength of brown heart and white material in shear, cleavage, or tension. The presence of brown heart in wood to be used for making last-blocks is not a serious defect, if the necessary care is taken during seasoning to ensure that stresses in the material are correctly relieved and that moisture distribution is uniform.

The origin of the condition is uncertain. Traces of a fungus are occasionally visible in both brown and white areas, but cultures proved negative, and in many brown heart areas there appeared to be no fungus present. The condition does not increase in intensity from the pith towards the white wood, but occupies irregularly spaced annular zones with areas of lighter brown heart wood between. The abnormal density of the affected parts supports the hypothesis that brown heart is a form of mineral staining.

Destructive Insect and Pest Acts, Scotland. The Wart Disease of Potatoes (Scotland) Order of 1938. Dated June 3, 1938.—11 pp., 1938.

The Wart Disease of Potatoes (Scotland) Order of 1938, effective as from 1st July, 1938, prohibits the planting of non-immune varieties, except by special permission of the Department of Agriculture, in (*a*) holdings not exceeding half an acre in extent, (*b*) private gardens, or (*c*) holdings in which *Synchytrium endobioticum* is known to have existed at any time, to which the provisions of the Order of the same name of 1923 [*R.A.M.*, iii, p. 112] have been applied, in which the disease may at any time subsequent to the date of the present Order be found, or to which it is likely in responsible opinion to spread. The First Schedule to the Order contains a list of infected areas. Details are given of the precautions to be adopted in case of an outbreak of disease. Potatoes from England and Wales and abroad may be planted only under licence from the Department, and from Northern Ireland and Eire if certified as grown on land at least one mile distant from any infected area. Scottish-grown material for planting in England and Wales must be similarly certified.

Union of South Africa. Department of Agriculture and Forestry. Agricultural Pests Act (Act No. 11 of 1911), as amended. Agricultural Pests (Citrus Canker) Act (Act No. 10 of 1919) and Psorosis Act (Act No. 42 of 1927). Proclamations, Government Notices and Regulations.—54 pp., 1937. Proclamations Nos. 201, 202 of 1937.—*Govt Gaz., Pretoria*, No. 2471, 1937. [Received October, 1938.]

Particulars are given of the provisions of the Acts mentioned in the title and of certain proclamations under these acts. Proclamation No. 201 of 1937 (30th September) excludes the territory administered by the Companhia de Moçambique outside the Districts of Beira, Buzi, Neves, Ferreira, and Cheringoma (Portuguese East Africa) from the provisions of the Agricultural Pests Act, 1911, regulating the introduction of citrus fruit into the Union. Proclamation No. 202 of 1937 (30th September) provides for the exclusion of citrus fruits from the Districts mentioned above and of all citrus fruits outside these Districts, unless accompanied by a certificate from the Department of Agriculture, Beira, giving full particulars of their origin.

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